GROUND-WATER/SURFACE-WATER INVESTIGATION PLAN

PHASE 2 REMEDIAL INVESTIGATION DRAFT REPORT

VOLUME II of III

Appendices A through C

May 29, 1992

Prepared for:

Industri-Plex Site Remedial Trust
36 Commerce Way
Woburn, Massachusetts

Prepared by:

Roux Associates, Inc.
Environmental Science & Engineering, Inc.
PTI Environmental Services

ROUX

APPENDIX A

Standard Operating Procedures

A1	Ground-Water Sampling
A2	Surface-Water Sampling
A3	Stream Sediment Sampling
A4	Measuring Water Temperature
A5	Measuring the pH of Water Samples
A6	Measuring Water Levels with a Steel Tape
A7	Measuring Water Levels with an M-Scope
A8	Measuring the Conductivity of Water Samples
A9	Field Filtering Water Samples for Metals Analyses
A10	Ground-Water Monitoring Well Drilling Formation Sampling, Well Construction and Development
A11	Measuring Dissolved Oxygen in Water
A12	Measurement of Eh of Water Samples
A13	Decontamination of Field Equipment
A14	Quality Control
A15	Sampling for Macro Invertebrates and Fish
A16	Field Sampling and Analytical Procedures for the Metals Mobility Study

APPENDIX A1

Ground-Water Sampling

STANDARD OPERATING PROCEDURE
FOR SAMPLING GROUND-WATER OBSERVATION WELLS

1.0 MATERIALS AND EQUIPMENT

1.1 The following items may be required for monitoring well sampling and data collection:

a. Appropriate bailer(s) for test substances.
b. Non-absorbent cord (e.g., polypropylene).
c. Pre-measured plastic bucket(s).
d. Plastic sheets.
e. m-scope
f. Tape measure (steel - tenth of a foot measurement increments) and chalk.
g. Pen knife.
h. Field forms/Field notebook.
i. Well location map.
j. Cleaning agents (detergent, distilled or deionized water, potable water).
k. Pump (if purging required) and associated materials such as:

    1. Teflon tape.
    2. Appropriate tubing (e.g., polyethylene) if using peristaltic pump.
    3. Portable generator if using submersible pump.

l. Water Well Handbook.
m. Calculator.
n. Hard hat (if required on location).
o. pH meter.
p. Conductivity meter.
q. Thermometer.
r. Paper towels, clean rags.
s. Black pen and pencil.
t. Wet ice and/or blue packs.
u. Sample jars, codes, and labels.
v. Electrical tape.
w. Pipe wrench.
x. Screwdriver, hammer.
y. Cooler(s).
z. Water jugs.
aa. Disposable gloves
bb. Well keys.
cc. Masking and packing tape.
dd. Water-proof marker.
ee. Well sampling form(s).
ff. Non-phosphate, laboratory-grade detergent.

gg. Distilled/deionized water.
hh. Chain-of-custody form(s).
ii. Custody seal(s).
jj. Extra batteries (meters, thermometer).
kk. Buffer/calibration solutions.

2.0 PROCEDURE

2.1 Once the wells are in place, and properly developed, ground-water samples will be taken for water-quality analyses. Due to temporal changes in ground-water quality, wells will be sampled at the onset of the sampling program and continued on a periodic basis through the winter and into the next season.

2.2 Make sure all equipment is decontaminated, cleaned, and calibrated before use and document daily activities in the field notebook.

2.3 Document well identification and pre-sampling information in the field notebook as needed.

2.4 Inspect the protective casing of the well and note any items of concern such as a missing lock or bent casing. Complete the Well Inspection Checklist.

2.5 Place plastic sheeting around the well to protect sampling equipment from potential contamination.

2.6 Remove the well cap or plug and clean the top of the well off with a clean rag. Place the cap or plug on plastic.

2.7 Measure the depth to water using an electronic probe (m-scope) or steel tape and chalk. Document in the field notebook.

2.8 Measure the depth of the well with the steel tape. Calculate and record the volume of water in the well in the field notebook.

2.9 Prior to sampling, the well should be pumped or bailed to remove a minimum of three casing volumes (if the recharge rate is adequate to accomplish this within a reasonable amount of time) or the well should be pumped or bailed dry if the formation cannot produce enough water to sustain purging.

2.10 Record the physical appearance of the water in the field notebook (e.g., color, turbidity, odor, etc.) as it is pumped or bailed.

2.11 If the bailer has not been decontaminated, decontaminate it according to the procedures described previously. If the bailer has been decontaminated, flush it several times with distilled/deionized water, and collect and discard (in an appropriate manner) three bails of well water before collecting the sample.

2.12 Using a non-absorbent cord (e.g., polypropylene), lower the bailer into the well.

2.13 Quality-control samples will be used to monitor sampling and laboratory performance and may include replicates, and blanks, spikes.

a. Replicate analysis is done to check on laboratory reproducibility of results. The procedure to be used for taking replicate samples follows. If samples are collected for volatile organic compound (VOC) analysis, then the water from the bailer will be distributed first to fill one VOC container and then to fill the second VOC container. Adequate water will be available to fill the bottles completely before they are capped. All water samples collected for volatile organic compound (VOC) analysis will be collected using a bailer, poured into septum-sealed VOA vials, and preserved with nitric acid.

b. Trip blank analysis is performed to detect if contamination has occurred during field handling, shipment, or in the laboratory. A trip blank is a container that is filled with distilled/deionized water in the laboratory, and travels unopened with the sample bottles. One VOA trip blank will accompany each cooler which contains VOA samples. It is opened in the laboratory and analyzed along with the field samples for the constituent of interest.

c. Equipment blank analysis provides a check on sampling procedures. An equipment blank is made with distilled/deionized water by exposing it to the sampling processes (e.g., bailer). The clean water will be poured into the bailer (which has been decontaminated and is ready for sampling) and then into the sampling container. One equipment blank will be collected for every 20 samples collected or one per sampling trip, whichever results in fewer samples.

d. A matrix spike, which is performed in the laboratory, is a check on the laboratory's ability to recover the matrix. Spikes of standard compounds may be added to samples in the laboratory to determine if the ground-water constituents are interfering with test substance identification or quantification. Such analyses may also point to systematic errors and lack of sensitivity of analytical equipment. The laboratory will analyze one matrix spike and one replicate matrix spike per every 20 samples analyzed.

2.14 Place samples in the pre-labeled containers and store on ice (we ice or blue packs).

2.15 After sample collection is complete, measure and record the temperature, conductivity, pH, and physical appearance of the water, and record in the field notebook.

2.16 Wipe the well cap with a clean rag, replace the well cap and protective cover (if present). Lock the protective cap.

2.17 Verify that each sample is placed in an individual "zip-lock" bag, wrapped with "bubble wrap," and placed in its appropriate container (holder) in the cooler, and that the cooler has sufficient ice (wet ice or blue packs) to preserve the samples for transportation to the laboratory.

2.18 Decontaminate non-disposable bailers, hoses, and pumps as discussed in the decontamination section. Wrap decontaminated equipment with a suitable material (e.g., clean plastic bag or aluminum foil). Discard the cord, rags, gloves, disposable bailers, etc. in a manner consistent with accepted procedures.

2.19 Complete the Chain-of-Custody forms. One copy of the Chain-of-Custody form is retained. Secure the cooler with sufficient packing tape and a Custody Seal. Forward the samples via overnight (express) mail or hand deliver to the designated laboratory preferably within 24 hours but no later than 48 hours after sampling.

APPENDIX A2

Surface-Water Sampling

STANDARD OPERATING PROCEDURE FOR SURFACE-WATER MEASUREMENTS AND SAMPLING

1.0 MATERIALS/EQUIPMENT

1.1 The following items may be needed for sample collection:

a. Wading rod and current meter.
b. Plastic sheeting.
c. Maps (topographic and road/county maps).
d. Meters (e.g., pH, conductivity).
e. Calibration equipment/materials.
f. Bailers.
g. Measuring tapes (100 foot, weighted).
h. Field notebook.
i. Coolers and ice (wet ice, blue packs).
j. Sample bottles.
k. Non-phosphate, laboratory-grade detergent.
l. Distilled or deionized water
m. Disposable sampling gloves

2.0 LOCATION SELECTION AND DESCRIPTION

2.1 Surface-water samples will be collected at the locations discussed in the text. Surface-water samples will be collected prior to stream sediment samples.

2.2 Record the location, date and time, of the selected sampling point in the field notebook.

3.0 SAMPLE COLLECTION PROCEDURE

3.1 Collect the appropriate samples and place the samples into pre-labeled containers.

3.2 If samples are to be included for quality control purposes to monitor sampling and/or laboratory performance (e.g., replicates, blanks and spikes) then quality control procedures will be followed.

3.3 Place all samples on ice in the cooler immediately after collection.

3.4 Verify that each sample is wrapped with "bubble wrap", and placed in its appropriate container (holder) in the cooler, and that the cooler has sufficient ice (wet ice or blue packs) to preserve the samples for transportation to the laboratory.

3.5 Decontaminate sampling equipment as discussed in the decontamination section. Wrap decontaminated equipment with a suitable material (e.g., clean plastic bag or aluminum foil). Discard any cord, rags, gloves, disposable bailers, etc. in the appropriate manner.

3.6 Complete the appropriate field forms and the Chain-of-Custody forms. One copy of the Chain-of-Custody form is retained. Secure the cooler with sufficient packing tape and a Custody Seal. Forward the samples via overnight (express) mail to the designated laboratory preferably within 24 hours but no later than 48 hours after sampling.

APPENDIX A3

Stream Sediment Sampling

STANDARD OPERATING PROCEDURE FOR STREAM-BOTTOM SEDIMENT SAMPLING

1.0 MATERIALS/EQUIPMENT

1.1 The following items may be needed for sampling:

a. "Zip-lock" plastic bags.
b. Laboratory-supplied sample containers.
c. Non-phosphate, laboratory-grade detergent.
d. Brushes.
e. Steel measuring tape.
f. Disposable gloves.
g. Waders.
h. Distilled/Deionized water.
i. Stainless-steel spoons, knives, or spatulas.
j. Boat and Trailer (if required)
   - lifejackets
   - oars
   - elector motor
   - anchor
   - fiberglass bins
   - toolbox
   - paper towels
   - plastic trash bags
k. Petite Ponar Dredge
l. Polyethylene Trays
m. Sample Containers
n. Large Wash Bottle
o. Coolers.
p. Ice (wet ice and/or blue packs).
q. Field notebook.
r. Chain-of-Custody forms and Custody Seals.

2.0 PROCEDURE

2.1 Identify the sampling station location and document it in the field notebook.

2.2 Sampling is to begin at the furthest downstream station and proceed upstream. Stream sediment samples will be collected upstream of the sampler's location.

2.3 Measure the width of the stream by stretching a steel measuring tape across the stream. Record the stream width in the field notebook.

2.4 The sampling equipment is thoroughly cleaned prior to use in accordance with the standard decontamination procedures.

2.5 If using boat, position boat stern at sampling point and drop anchor from the bow.

2.6 Pre-label two polyethylene jars. Use pencil or indelible marker and include sample location, sample and/or lot number, date, time, project number, and initials.

2.7 Fill plastic wash bottle with water, preferable using water outside the boat.

2.8 Don protective gear (gloves, glasses, boots, etc.)

2.9 Carefully set the jaws of Ponar Dredge in the open position using the spring-loaded catch. Deploy into the water and lower to bottom until the lines feels slack. Tug line gently three times to insure that the mouth of the dredge is squarely set on the bottom and that the spring-loaded catch releases. Pull dredge up at a constant speed, hand over hand, until it is visible and along side of the boat.

2.10 Have field assistant ready fiberglass bin. Carefully pull up grab sampler from the side of the boat and place in bin. Reset jaws of dredge and completely rinse remaining sediment into bin with was bottle.

2.11 Carefully decant excess water from bin overhead.

2.12 Transfer sediment sample to prelabelled sample containers. Fill container as full as possible, place lid on container, and screw on lid. Seal lid with parafilm, place container in bubble pack, and place in cooler.

2.13 Label the sample container with the appropriate information, such as the station number, distance in feet from the left bank (looking upstream), time and date, and initials of field scientist collecting the samples. Place each sample container in a cooler with ice.

2.14 After each sample, decontaminate the sampling equipment according to the procedures. After the final sample collection and decontamination wrap the sampling equipment in an appropriate clean material (e.g., aluminum foil).

2.15 Each sample is visually inspected and logged in detail in the field notebook.

2.16 Make sure that there is enough ice for transportation of the samples to the laboratory and arrange for overnight shipment. Enclose a completed Chain-of-Custody form for all the samples collected. One copy of the Chain-of-Custody form is retained. Secure each cooler with a Custody Seal.

APPENDIX A4

Measuring Water Temperature

STANDARD OPERATING PROCEDURE FOR MEASURING WATER TEMPERATURE

1.0 CALIBRATION

1.1 Calibration of thermometers will be performed before entering the field and checked upon return to the office.

1.2 Thermometers will be calibrated against a National Bureau of Standards (NBS)-traceable thermometer.

1.3 The thermometer must read within 1° - 1.5° C of the NBS - traceable thermometer. If the thermometer does not read within this range and the thermometer cannot be calibrated, then it will not be used for temperature measurements and will be disposed of in an appropriate manner. If the thermometer does not read within this range and the thermometer can be calibrated, then the thermometer will be calibrated to the NBS- traceable thermometer.

1.4 The following information is documented in the calibration logbook at the time of calibration:

a. Date
b. Thermometer Identification
c. Initials

2.0 PROCEDURE

2.1 The thermometer is immersed in water until the temperature equilibrates. The temperature is read in °C.

2.2 Temperature data are recorded in the field notebook, and initialed and dated.

APPENDIX A5

Measuring the pH of Water Samples

STANDARD OPERATING PROCEDURE
FOR MEASURING THE pH OF WATER SAMPLES

1.0 CALIBRATION

1.1 Calibration of the pH meter is to be performed prior to its use.

1.2 Re-calibration must occur if: (1) the pH of the samples being measured is outside the previous calibration range, (2) the procedure or use conditions warrant frequent calibrations, (3) four or more hours have elapsed, or (4) the instrument has been moved from one area to another.

1.3 Two buffer calibrations bracketing the expected pH range of samples are to be performed prior to its use in a study. Three pH buffers (4.0, 7.0, and 10.0) are read after standardization at pH of 7.0 to evaluate the linearity and electrodes. The measurements of sample and buffers must be made while stirring. The samples and buffers are measured at the same temperature.

1.4 The following information is documented in the calibration logbook at the time of calibration:

a. Date.
b. pH meter identification.
c. Initials.
d. Calibration results using pH standards.

2.0 PROCEDURE

2.1 No warm-up period is necessary if the instrument is kept in the standby (STBY) mode. A half-hour warm-up is required if the instrument is unplugged.

2.2 The pH electrodes must be kept in good working order as follows:

a. Proper levels of electrolyte solution are maintained. The electrolyte solution level should be at least 1 inch above the solution being measured.

b. The electrodes must be carefully rinsed with deionized water before each measurement.

2.3 The electrodes are immersed in a water sample and stirred continuously until the pH reading equilibrates.

2.4 Pertinent data are documented in the field notebook, and initialed and dated.

2.5 The electrodes are rinsed with deionized/distilled water and the unit stored properly (capping and storing in a buffer such as altex electrode storage solution). The electrodes are not to be stored in tap water or deionized/distilled water.

APPENDIX A6

Measuring Water Levels with a Steel Tape

STANDARD OPERATING PROCEDURE
FOR MEASURING WATER LEVELS WITH A STEEL TAPE

1.0 PROCEDURE

1.1 The steel tape must be pre-cleaned (decontaminated) using a non-phosphate, laboratory-grade solution and distilled/deionized water.

1.2 If the well is being sounded (depth measured), then lower the tape to the bottom of the well and measure its length.

1.3 If a water-level measurement is to be taken, then apply chalk (e.g., carpenter's chalk) to the bottom few feet of the tape and lower it into the water. Hold the top of the tape at an even foot-increment at the measuring point, roll up the tape, and note the cut (i.e., the mark between the dry and wet chalk).

1.4 Measurements will be taken to the nearest 0.01 foot.

1.5 All pertinent data will be recorded in the field notebook, and initialed and dated.

APPENDIX A7

Measuring Water Levels with and M-Scope

STANDARD OPERATING PROCEDURE
FOR MEASURING WATER LEVELS USING AN M-SCOPE

1.0 PROCEDURE

1.1 The m-scope must be pre-cleaned (decontaminated) using a non-phosphate, laboratory-grade solution and distilled/deionized water before use.

1.2 The manufacturer's model should be noted because some have switches, lights, beepers, or a combination of the above.

1.3 The water-level measurement is taken by lowering the probe into the well until the instrument-specific detection method (e.g., light, beeper, or both) is activated by contacting the water.

1.4 Measurements will be taken accurately and to the nearest 0.01 foot.

1.5 All pertinent data will be documented in the field notebook, and initialed and dated.

APPENDIX A8

Measuring the Conductivity
of Water Samples

STANDARD OPERATING PROCEDURE FOR MEASURING THE CONDUCTIVITY OF WATER SAMPLES

1.0 CALIBRATION

1.1 Calibration is in accordance with the manufacturer's specific directions, and the following information is documented in the calibration logbook:

a. Date.
b. Conductivity meter identification.
c. Calibration results.
d. Initials.

2.0 PROCEDURE

2.1 The probe is immersed in a water sample until the meter equilibrates.

2.2 In reading the conductivity meter scale, one or more of the following may have to be considered:

a. The reading may have to be multiplied appropriately (e.g., the reading is expressed in micromhos/centimeter).

b. If the conductivity meter is not capable of compensating for temperature differences, then note that the conductance measurements are not temperature compensated and document the temperatures.

c. If the conductivity meter can be compensated for temperature, then adjust the temperature control before reading the conductance measurement.

2.3 Conductivity measurements and any other relevant information are recorded in the field notebook, and initialed and dated.

APPENDIX A9

Field Filtering Water Samples
for Metals Analyses

STANDARD OPERATING PROCEDURE FOR FIELD FILTERING WATER SAMPLES FOR METALS ANALYSES

1.0 PURPOSE

The purpose for this standard operating procedure (SOP) is to describe the considerations and procedures for the field filtration of water samples for dissolved metals analyses prior to sample preservation. Filtering is implemented when the water sample originates from a medium-grained to fine-grained porous geologic formation that contains suspended fine-grained materials (fines) that cannot be prohibited from entering the water sample by well development or well design. Filtering is also implemented for surface-water samples. Since fines are not always distinctly visible in a water sample, all water samples will undergo filtration.

It should be noted that filtration of water for metals analyses has been a standard practice with the United States Geological Survey (USGS) for many years. Within this framework, filtration refers to the filtering of water either directly or at the end of a filtration series through a 0.45 micrometer (micron) membrane filter (i.e., the presence of a large quantity of fines may require the prefiltering of the sample with a larger size[s] membrane filter[s] prior to the 0.45 micron filter to avoid clogging the 0.45 micron filter and using an exorbitant amount of time to filter).

Filtration will be done as soon as possible after a water sample is collected, preferably at the same time that the water is produced. The filtering equipment and membrane will be suitable for the intended analysis. The sampling and analysis plan (SAP) will be referred to for these and other special filtration conditions.

2.0 MATERIALS/EQUIPMENT

2.1 In order to field filter water samples, specific equipment and materials will be required. The equipment and materials needed for field filtering will include the following:

a. Non-phosphate, laboratory-grade detergent.
b. Distilled/Deionized water.
c. Laboratory-grade (HPLC) methanol.
d. Roux Associates field forms (i.e., Daily Log, Sampling, etc.)/field book.
e. Filtration apparatus (i.e., Geotech apparatus, Gelman apparatus, Buchner funnel, etc.), filters, prefilters.
f. Plasticware (i.e., premeasured buckets, beakers, flasks, funnels).
g. Teflon™ tape.
h. Vacuum pump (i.e., manual or electric).
i. Appropriate tubing.
j. Disposable gloves.
k. Sample jars with appropriate preservative (e.g., nitric acid) and labels.

3.0 DECONTAMINATION

3.1 Decontamination procedures for filtering equipment follow:

a. Wear disposable gloves while cleaning filtering equipment to avoid contamination and change gloves as needed.
b. Prepare a non-phosphate, laboratory-grade detergent solution and distilled or deionized water in a bucket.
c. Remove vacuum tubing from apparatus.
d. Remove filter membrane from apparatus.
e. Disassemble filtering apparatus and wash each piece of equipment with the non-phosphate, laboratory-grade detergent solution and distilled or deionized water.
f. Rinse filtering apparatus with distilled or deionized water.
g. Rinse filtering apparatus with methanol.
h. Rinse filtering apparatus three times with distilled or deionized water.
i. Air dry.
j. Wrap equipment with a suitable material (i.e., clean plastic bag, aluminum foil).

4.0 PROCEDURE

4.1 Ensure that the filtering equipment is properly decontaminated before use.

4.2 Assemble the filtering apparatus, and connect the vacuum pump in case it is needed to facilitate filtering (i.e., if the sample contains sufficient suspended fines to preclude gravity filtration).

4.3 Place a clean (new) 0.45-micron pore size filter in the apparatus. Use larger, pore size filters if prefiltering is required (i.e., if suspended sediment is present that would quickly clog the 0.45-micron filter and prevent continuous filtration).

4.4 Obtain the water sample using an appropriate, decontaminated sample collection device (e.g., bailer, pump, jar).

4.5 Pass the unpreserved water sample through the prefilter, if needed, and the 0.45-micron filter into the flask or sample bottle. Apply a vacuum using the vacuum pump, if needed, to facilitate filtering.

4.6 If necessary, transfer the filtered water sample to the appropriate, pre-labeled sample container containing the preservative (e.g., nitric acid) being careful not to overfill the container and dilute the preservative. Using pH paper, check the preserved water sample to ensure that the pH is less than 2.

4.7 Follow standard operating procedures for sample documentation, shipping, and tracking (i.e., record keeping).

4.8 Decontaminate the filtering equipment that came in contact with the water sample.

STANDARD OPERATING PROCEDURE FOR GROUND-WATER OBSERVATION WELL OR PIEZOMETER DRILLING, FORMATION SAMPLING, AND CONSTRUCTION DEVELOPMENT

1.0 DESCRIPTION OF DRILLING TECHNIQUE

1.1 Roux Associates has chosen to drill the ground-water observation wells and piezometers using the hollow-stem auger - This drilling method is rapid and extremely effective in most cohesive sediments but less so in loose sandy material. If local conditions (i.e., many boulders) make hollow stem auger drilling difficult, solid stem auger may be substituted.

2.0 PROCEDURE FOR FORMATION SAMPLING

2.1 Intact formation samples will be collected using a split-spoon sampler. A standard 140-pound in-hole wire line hammer will be used to advance the split-spoon sampler. The number of blow counts (i.e. the hammer dropping 30 inches) will be recorded for each 6-inch interval.

2.2 Continuous split-spoon samples will be collected in one borehole at each well cluster.

2.3 The soil cores from the wells drilled at the site will be used for confirmatory lithologic identification.

2.4 Before collecting and retaining soil and/or sediments collected with the split-spoon sampler, the top several inches will be removed from the sampler and discarded to eliminate any sediment that may have caved into the bottom of the borehole.

2.5 Sediment sampling equipment such as split-spoon samplers, spatulas, etc. will be decontaminated according to the standard protocols.

3.0 DESCRIPTION OF MONITORING WELL CONSTRUCTION

3.1 The installation of each piezometer or observation well will begin immediately after borehole completion. In cases of unscheduled delays, such as personal injury, equipment breakdowns or sudden inclement weather, installation will be resumed as soon as practical.

3.2 The observation well will be constructed of 4-inch diameter PVC casing and screen. Piezometers will be similarly constructed of 2-inch diameter PVC casing. A generalized well construction diagram is included as Figure A-1.

3.3 Observation wells or piezometers in unconsolidated formations will be set as follows:

a. The screen and casing will be lowered into the borehole to the appropriate depth.

b. A gravel pack (quartz sand) is filled in around the screen to several feet above the screened interval (to allow for potential settlement during subsequent development).

c. A bentonite pellet seal will be placed above the clean silica sand pack.

d. A locking steel protective casing or curb box is set over the well and cemented in place. The protective case, or curb box is designed to prevent water from ponding at the top of the well or directly entering the well.

3.4 Each well will be properly identified with the appropriate information (e.g., local well number, total depth, etc. A notch will be made in the top of the PVC casing to be utilized as the measuring point. Water levels will be measured from this notch. The measuring point will be surveyed to the nearest 0.01 foot relative to a datum (e.g., mean sea level) by a professional, state-licensed surveyor.

3.5 Each well will have a well construction log showing the casing placement and materials used to fill the annular space between the well casing and borehole. The appropriate log will show the depths of each casing material and discuss the geologic variability at the site. A description of the surface soils and unsaturated zone materials down to and including the water table is required. An example of the Well Construction Log and Geologic Well Log are shown as Figures A-1 and A-2, respectively.

The following information, if applicable, will be included on the well log:

a. Project number.
b. Date and initials of scientist documenting the well information.
c. Date/time of construction.
d. Well location.
e. Well/permit number.
f. Borehole diameter.
g. Well depth.
h. Casing material.
i. Screen material.
j. Screen slot size/length.
k. Gravel pack/type size (depths from _____ to _____).
l. Sand pack (depths from _____ to _____).
m. Bentonite pellets (depths from _____ to _____).
n. Bentonite slurry (depths from _____ to _____).
o. Cement/grout (depths from _____ to _____).
p. Ground-surface elevation.
q. Well height above/depth below land surface.
r. Depth ground water encountered.

4.0 DESCRIPTION OF WELL DEVELOPMENT

4.1 Before a newly constructed well can be used for water-quality sampling, it must be developed. Well development refers to the procedure used to clear the well and formation around the screen of fine-grained materials (sands, silts, and clays) produced during drilling or naturally occurring in the formation. Well development continues until the well responds to water-level changes in the formation (i.e, a good hydraulic connection is established between the well and formation and the well produces clear, sediment-free water to the extent practical).

4.2 Wells will be developed by either surging and bailing, or pumping (centrifugal, submersible, etc.).

4.3 A one-pint sample of the last water removed during development will be obtained and inspected by the field hydrogeologist for relative clarity to determine whether development is complete. Well development procedures will be documented in the field notebook.

4.4 Dispersing agents, acids, disinfectants, or other additives will not be used during development nor will they be introduced into the well at any other time. During development, water will be removed from the entire column of water standing in the well (e.g., by periodically lowering and raising the pump intake). Well development will include the rinsing of the interior well casing above the water column in the well using only water from that well.

APPENDIX A10

Ground-Water Observation
Well Drilling Formation Sampling
Well Construction and Development

STANDARD OPERATING PROCEDURE FOR THE CONSTRUCTION, DEVELOPMENT, AND ABANDONMENT OF OBSERVATION WELLS IN CONSOLIDATED FORMATIONS

1.0 PROCEDURE FOR WELL CONSTRUCTION

The installation of each bedrock well will begin immediately after borehole completion (and geophysical logging, if implemented). Once well installation has begun, no breaks in the process will be made until the well has been completed and secured against unauthorized access. In cases of unscheduled delays, such as personal injury, equipment breakdown or sudden inclement weather, installation will be resumed as soon as practical. If conditions are such that this course of action cannot be followed (e.g., friable or void-filled bedrock), then construction of the well may have to proceed as the borehole is drilled.

1.1 The well will be constructed with the appropriate type and diameter steel casing (and/or steel or PVC casing and screen, if conditions necessitate this) and will be at least 4 inches in diameter to readily accommodate water-sampling devices.

1.2 Fittings (couplings) will not restrict the inside well diameter, as steel casing will be welded and/or flush-joint threaded, and PVC joints will be internally threaded. Glues, solvents, or chemical cleaners will not be used in the construction of the wells. All casings, fittings, and screens will be new material. The well screens will be fabricated and have an inside diameter equal to the well casing. The lengths of casing and screen will be measured and recorded (on an appropriate field form or in the study notebook) by the field hydrogeologist prior to installation.

1.3 It is anticipated that wells in consolidated formations will be completed as open hole wells and therefore be installed as follows:

a. An appropriate size steel casing will be set a minimum of 5 feet into competent bedrock and pressure grouted through the inside of the casing using a cement and bentonite mixture. The grout will first fill the well casing, and then fill the annular space from the bottom of the borehole up, to seal-off overlying formations.

b. After the grout solidifies, the casing will be drilled out (using a bit of equal diameter as the casing) and an open hole will be drilled below the steel casing to the appropriate depth in the bedrock.

c. If a discrete depth in the bedrock is to be tapped by the well (open to the formation), then overlying portions of the formation(s) will be cased off with a steel casing to permit well completion in the zone of interest.

d. If the bedrock cannot support an open hole (i.e., formation collapse) then a cased and screened well will be installed as described below (Section 1.4).

e. A locking steel protective casing or curb box will be set over the well and cemented in place, or welded to the steel casing to prevent water from ponding at the top of the well or directly entering the well, and safeguard the well from accidental damage or vandalism.

1.4 Bedrock wells in noncompetent or void-filled consolidated formations that are subject to collapse will be installed as follows:

a. An appropriate size steel casing will be set and grouted into competent bedrock sand drilled-out (as above described in Sections 2.3 a, b and c).

b. The screen and casing will be lowered into the steel-cased borehole to the appropriate depth. Screen and casing materials may be either steel or PVC.

c. A gravel pack (quartz sand or pea gravel) will be filled in around the screen from a few feet below the bottom of the screen to several feet (approximately 5) above the screen, respectively, to avoid applying the weight of the casing on the screen (i.e., support the well until the grout solidifies) and to allow for potential settlement during subsequent development. The placement of the gravel pack may require the use of a tremie pipe.

d. An approximate 3-foot bentonite seal (powder or pellets) will be placed on top of the gravel pack.

e. The remainder of the annulus will be grouted to within a few feet of land surface. If PVC casing is used inside the steel outer casing, then extreme care must be taken in grouting the annular space in lifts (specified lengths) to avoid deformation of the PVC casing by the heat of curing and/or the weight of the grout.

f. A locking steel protective casing or curb box will be set over the well and cemented in place, or welded to the steel casing to prevent water from ponding at the top of the well or directly entering the well, and safeguard the well from accidental damage or vandalism.

1.5 Each well will be properly identified with the appropriate information (e.g., local well number, state and/or permit number [if applicable], etc.). The top of the well casing will serve as the measuring point (MP) for ground-water level measurements. The MP will be surveyed to the nearest 0.01 foot relative to a common datum (e.g., mean sea level) by a professional, state-licensed surveyor.

1.6 If required, well clusters will be constructed. Each well is open to, or screened at, a different depth to obtain data defining the vertical distribution of water levels and water quality in the aquifer or formation. In the event that a well cluster is drilled, one large-diameter (e.g., 8-inch, 10-inch, etc.) borehole may be drilled and each well in the cluster may be individually cased within that one borehole; however, the preferred method is to drill individual boreholes for each well in the cluster.

1.7 Each well will have a Well Construction Log (Figure A-3) and a Geologic Log (Figure A-2) (from the drilling) showing the casing placement and materials used to fill the annular space between the well casing and borehole. The appropriate log will show the depths of each casing material and discuss the geologic variability at the site. A description of the surface soils, if present, and the unsaturated zone materials down to and including the ground water is required.

The following information, if applicable, will be included on the well log:

a. Project number.
b. Date and initials of scientist documenting the well information.
c. Date/time of construction.
d. Well location.
e. Well/permit number.
f. Borehole diameter.
g. Well depth.
h. Casing material.
i. Screen material.
j. Screen slot size/length.
k. Gravel pack/type size (depths from _____ to _____).
l. Bentonite pellets (depths from _____ to _____).
m. Bentonite slurry (depths from _____ to _____).
n. Cement/grout (depths from _____ to _____).
o. Ground-surface elevation.
p. Measuring point elevation.
q. Well height above/depth below land surface.
r. Depth ground water encountered.

2.0 DESCRIPTION OF WELL DEVELOPMENT

2.1 Before a newly constructed well can be used for water-quality sampling, measuring water levels, or aquifer testing, it must be developed. Well development refers to the procedure used to clear the well and formation around the screen of fine-grained materials (sands, silts, and clays) produced during drilling or naturally occurring in the formation. Well development continues until the well responds to water-level changes in the formation (i.e, a good hydraulic connection is established between the well and formation) and the well produces clear, sediment-free water to the extent practical.

2.2 Depending on the drilling technique used, composition of the formation screened, and well diameter and construction materials, well development may include one or more of the following techniques.

a. Bailing.
b. Pumping (centrifugal, submersible, or air).
c. Backwashing.
d. Surging (mechanical).
e. Jetting.
f. A combination of the above.

2.3 A 1-pint sample of the last water removed during development will be obtained and inspected by the field hydrogeologist for relative clarity to determine whether development is complete. A turbidimeter may be used to evaluate the clarity of the water removed from the well during development (and its use may also be stipulated by a regulatory agency(ies). Well development procedures will be recorded on the Well Construction Log form (and may also be documented on the Daily Log form or in the study notebook).

2.4 Dispersing agents, acids, disinfectants, or other additives will not be used during development nor will they be introduced into the well at any other time. During development, water will be removed from the entire column of water standing in the well (e.g., by periodically lowering and raising the pump intake). Well development will include the rinsing of the interior well casing above the water column in the well using only water from that well.

3.0 PROCEDURE FOR WELL ABANDONMENT OR CLOSURE

3.1 If a determination is made be the client and Roux Associates to close (i.e., abandon and seal) a well, the abandonment will be in accordance with local, State and/or Federal regulations.

3.2 For each abandoned well, the procedure will be documented on an appropriate field form or in the study notebook. Documentation may include, where appropriate, the following:

a. Well designation.
b. Location with respect to the replacement well, if replaced (e.g., 30 feet north and 40 feet west of Well MW-1). A Location Sketch form will be used.
c. Open depth prior to grouting and any other relevant circumstances (e.g., formation collapse).
d. Well casing left in the borehole by depth, size, and composition.
e. A copy of the Geologic Log.
f. A revised diagram of the abandoned well using the Well Construction Log form.
g. Additional items left in hole by depth, description, and composition (e.g., lost tools, bailers, etc.).
h. A description and daily quantities of grout used to compensate for settlement.
i. The dates of grouting.
j. The level of water prior to grouting and the date measured.
k. The remaining casing, size, and composition above/below ground surface reported in depths/heights from ground surface.
l. Any other state or local well abandonment reporting requirements.

APPENDIX A11

Measuring Dissolved Oxygen in Water

STANDARD OPERATING PROCEDURES
FOR MEASURING DISSOLVED OXYGEN IN WATER

1.0 CALIBRATION

Follow manufacturer's calibration procedure exactly to obtain guaranteed precision and accuracy. Calibrate membrane electrodes by reading against air and a sample with zero dissolved oxygen (DO). (Add excess sodium sulfite, Na_2SO_3, and a trace of cobalt chloride, $CoCl_2$, to bring DO to a zero.) Preferably calibrate with samples of water under test.

2.0 PROCEDURE

Follow all precautions recommended by manufacturer to insure acceptable results. Take care in changing membrane to avoid contamination of sensing element and also trapping of minute air bubbles under the membrane, which can lead to lowered response and high residual current. Provide sufficient sample flow across membrane surface to overcome erratic response. Dissolved oxygen will be measured in situ where possible (i.e., surface water). All sampling methods used will be recorded. The probe will be decontaminated with distilled water between samples.

2.1 Validation of temperature effect:
Check frequency one or two points to verify temperature correction data as recommended in manufacturer's instructions.

APPENDIX A12

Measurement of Eh of Water Samples

STANDARD OPERATING PROCEDURE FOR MEASUREMENT OF Eh OF WATER SAMPLES

1.0 PROCEDURE

1.1 Follow all manufacturer's instructions on procedures for filling the electrode and correcting it to the meter.

1.2 Connect the electrode to the meter, set the function switch to the millivolt mode, and place the electrode in the sample solution, being certain to keep the filling solution level in the electrode at least one inch above the level of the sample solution.

1.3 When the reading stabilizes, record the potential in the field notebook.

APPENDIX A13

Decontamination of Field Equipment

STANDARD OPERATING PROCEDURE FOR DECONTAMINATION OF FIELD EQUIPMENT

1.0 PROCEDURE FOR DRILLING EQUIPMENT

The following is a decontamination procedure for drilling equipment. Any variation from this method will be documented on an appropriate field form or notebook.

1.1 The rig and all associated equipment should be properly decontaminated before arriving at the test site.

1.2 The augers, drilling casings, rods, samplers, tools, rig, and any piece of equipment that can come in contact (directly or indirectly) with the soil, will be high pressure hot water washed on site prior to set up for drilling to ensure proper decontamination.

1.3 The same high pressure hot water wash procedures will be followed between boreholes (at a fixed on-site location, if appropriate) and before leaving the site at the end of the study.

1.4 All on-site high pressure hot water washing (decontamination) activities will be monitored by the field hydrogeologist.

2.0 PROCEDURE FOR SOIL-SAMPLING EQUIPMENT

The following is a decontamination procedure for soil sampling equipment (e.g., split spoons, stainless steel spatulas).

2.1 Wear disposable gloves while cleaning equipment to avoid contamination and change gloves as needed.

2.2 High pressure hot water wash the split-spoon sampler, or rinse with distilled or deionized water.

2.3 Prepare a non-phosphate, laboratory-grade detergent solution and distilled or deionized water in a bucket.

2.4 Disassemble the split-spoon sampler and immerse all parts and other sampling equipment in the solution.

2.5 Scrub all equipment in the bucket with a brush to remove any adhering particles.

2.6 Rinse all equipment with distilled or deionized water.

2.7 Rinse all equipment with 10% nitric acid (if sampling for metals).

2.8 Rinse all equipment with distilled or deionized water.

2.9 Rinse all equipment with hexane (if sampling for pesticides/PCBs).

2.10 Rinse all equipment with distilled or deionized water.

2.11 Rinse all equipment with methanol (if sampling for volatile organic compounds).

2.12 Rinse all equipment three times with distilled or deionized water.

2.13 Place clean equipment on a clean plastic (e.g., polyethylene) sheet.

2.14 Reassemble the cleaned split-spoon sampler.

2.15 Transfer the sampler to the driller (or helper) making sure that this individual is also wearing clean gloves, or wrap the equipment with a suitable material (e.g., plastic bag, aluminimum foil).

3.0 PROCEDURE FOR WATER SAMPLING EQUIPMENT

The following is a decontamination procedure for water sampling equipment (e.g., non-disposable bailers).

3.1 Wear disposable gloves while cleaning bailer to avoid contamination and change gloves as needed.

3.2 Prepare a non-phosphate, laboratory-grade detergent solution and distilled or deionized water in a bucket.

3.3 Disassemble bailer (if applicable) and scrub each part with the detergent and water using a brush.

3.4 Rinse with distilled or deionized water and reassemble bailer.

3.5 Rinse bailer with 10% nitric acid (if sampling for metals).

3.6 Rinse bailer with distilled or deionized water.

3.7 Rinse bailer with hexane (if sampling for pesticides/PCBs)

3.8 Rinse bailer with distilled or deionized water.

3.9 Rinse bailer with methanol (if sampling for volatile organic compounds).

4.0 Rinse bailer with distilled or deionized water.

4.1 Air dry.

4.2 Wrap equipment with a suitable material (e.g., clean plastic bag, aluminum foil).

4.3 Rinse bailer at least three additional times with distilled or deionized water before use.

APPENDIX A14

Quality Control

STANDARD OPERATING PROCEDURE FOR QUALITY CONTROL

1.0 RESPONSIBILITY

1.1 The project hydrogeologist will verify the integrity of the well and ensure that all wells are constructed to specification, are adequately developed, and sampled using the appropriate equipment to properly collect the samples needed to meet study objectives. The project hydrogeologist will verify that all sampling, equipment is properly decontaminated according to the standard procedures, that all samples are properly handled and packaged to avoid possible cross contamination or breakage and that the standard shipping procedures (i.e., Chain-of-Custody forms, Custody Seals, etc.) and deadlines are met.

1.2 All field work will be done by or under the direct supervision of an experienced project hydrogeologist from Roux Associates, Inc. The project manager or project hydrogeologist, and Quality Assurance Unit (QAU) officer will be present for critical phases of the study, inspection of site activities, procedural review, and communication with field hydrogeologist and client personnel.

2.0 QUALITY CONTROL SAMPLES

2.1 Samples taken for analysis of compounds may require the use of quality control samples to monitor sampling activities and laboratory performance. Types of quality control samples may include replicate and/or replicate split, trip blank, field (equipment) blank, and matrix spike. A discussion pertaining to each quality control sample follows:

1. Replicate and Replicate Split - Replicate sample analysis is done to check on the reproducibility of results either within a laboratory or between laboratories. A replicate sample is called a split sample when it is collected with or turned over to a second party (e.g., regulatory agency, consulting firm) for an independent analysis. Replicate samples are aliquots from a sample in a common container.

   If samples are collected for volatile organic compound (VOC) analysis, then the water from the bailer or pump will be distributed first to fill one VOC container and then to fill the second VOC container. Adequate water should be available to fill the bottles completely before they are capped. If the water is insufficient to fill all the bottles at once, then incrementally with water from two or more bailer volumes or pump cycles.

   For other test substances, water should be accumulated in a common container and then decanted slowly into the sample bottles. In the case of wells that recover slowly and produce insufficient water to fill all the replicate sample containers, the containers should be filled incrementally and kept on ice in the cooler in between filling periods.

2. Trip Blank - A trip blank sample is a sample bottle that is filled with "clean" (e.g., distilled/deionized) water in the laboratory, and travels unopened with the sample bottles. It is opened in the laboratory and analyzed along with the field samples for the constituent(s) of interest (e.g., test substance, etc.). Analysis of trip blanks is performed to detect if contamination has occurred during field handling, shipment, or in the laboratory. One trip blank would accompany each day's samples.

3. Equipment and field Blanks - An equipment blank sample is collected to check on the sampling procedures implemented in the field. An equipment blank is made with "clean" (e.g., distilled/deionized) water by exposing it to sampling processes (i.e., the clean water must pass through the actual sampling equipment) For example, if samples are being collected with a bailer, the equipment blank would be made by pouring the clean water into a bailer which has been decontaminated and is ready for sampling, and then pouring from the bailer into the sample containers. If a metals equipment blank is to be made, the sample must be filtered. One equipment blank would be incorporated into the sampling program for each day's collection of samples and analyzed for the identical suite of constituents as the sample.

   The location(s) for preparation of field blank(s) will be specified in the sampling plan. Often an equipment blank is made just before sampling the last well to check for accumulated cross contamination. However, it may also be made before sampling a background well or between sampling events during the day. A field blank might be made at a location where ambient air quality is poor, to check for atmospheric interference.

2. Matrix Spike - Spikes of compounds may be added to samples in the laboratory to determine if the ground-water matrix is interfering with constituent identification or quantification. Such analyses may also point to systematic errors and lack of sensitivity of analytical equipment. That is, a matrix spike, which is performed in the laboratory, provides a check of the laboratory's ability to recover the matrix.

APPENDIX A15

Sampling for Macro Invertebrates and Fish

4.0 SAMPLING EQUIPMENT AND PROCEDURES

4.1 Sampling for Fish and Macroinvertebrates

4.1.1 Habitat Evaluation

Each biological sampling station will be identified in the field with a flag or stake. Care will be taken to see that surface water and sediment sampling regimes do not interfere with biological sampling activities (which will be upstream of the former).

The habitat of each station will be observed and evaluated by a field biologist, according to USEPA methodology (USEPA, 1989f, section 5). The evaluation will include measurements of water quality (e.g., D.O., pH, TSS) and sediment characteristics (e.g., grain size).

4.1.2 Sampling for Fish

Fish will be sampled (State Permit No. SCF35.00) using a 5 ft x 100 ft monofilament gill net (½ in., 1 in., 2 in., 4 in., and 5 in. mesh). Nets will be deployed at depths of approximately 8 to 10 feet and examined every 24 hours. For smaller fish, minnow traps will be deployed with a commercial bait. An attempt will be made to take five fish from each of the following trophic levels: forager, bottom-feeder, and predator.

All fish will be measured to length and weighed with a portable spring scale. Small fish will be placed in a prelabelled plastic zip-loc bag and frozen on dry ice. Larger fish will be sampled for fillet (muscle) and offal (viscera minus gut contents). These samples will also be placed in prelabelled zip-loc bags and frozen on dry ice.

4.1.3 Sampling for Macroinvertebrates

Macroinvertebrates will be sampled and evaluated qualitatively; all specimens taken at each station will be preserved in the event that quantitative evaluation may be needed. If a large number of organisms are present, individual organisms will be chosen from the sample using random sampling techniques (USEPA, 1989f). Macroinvertebrates will be sampled with a Surber sampler in streams that have a sufficient flow rate. Ponded areas or streams that exhibit low flow will be sampled with a D-net or a Ponar grab sampler. Mesh sizes on all sampling devices or processing screens will be 5 mm. Sampling depth of the benthic

substrate will be approximately 10 cm. Samples will be processed in white enamel pans, transferred to prelabeled 1-liter plastic bottles, and stored in 70 percent ethanol. Each bottle will also contain alcohol resistant internal label as a quality control measure.

Complete taxonomic references, as well as a reference collection, are available to assist in taxonomic identification. Macroinvertebrates will first be separated, station by station, according to Order and identification will be made at least to Family level; identification will be made to genus whenever possible.

4.2 Sampling of Ground Water, Surface Water and Stream Sediments

All sampling of ground water, surface water, and stream sediments will be done in accordance with the Standard Operating Procedures given in Attachment 1 of Appendix A.

APPENDIX A16

Field Sampling and Analytical
Procedures for the Metals Mobility Study

APPENDIX A16

Field Sampling and Analytical Procedures for the Metals Mobility Study–PTI

Flow-Through Cell: Zero Headspace Sample Collection Field Parameters

All ground-water monitoring wells were purged initially by bailing three pore volumes of water. The ground water was sampled immediately after bailing using oxygen-impermeable tubing connected to a peristaltic pump (Geofilter), emplaced several feet below the water surface to minimize collection of water from the reoxygenating zone at the surface. Each water sample was pumped directly into the bottom of a polycarbonate flow-through cell. The electrodes (pH, Eh, conductivity, temperature, and dissolved oxygen) were mounted inside the flow-through cell in air-tight fittings. Ground water was allowed to fill the cell, all bubbles were bled off from the fitting, and pumping continued until the electrode readings stabilized, typically after two additional cell volumes of ground water had flushed through the system.

Arsenic: Analytical Procedure

The work plan proposed using an ion chromatography field separation method (Grabinski, 1981) for As(III), As(V), monomethylarsonic acid (MMAA), and dimethylarsinic acid (DMAA, cacodylic acid). This method required on-site separation of arsenic species using a combination of cation and anion exchange chromatography with an elution sequence of trichloroacetic acid and ammonium hydroxide. However, analysis of a preliminary ground-water sample from OW-16 submitted to Battelle Northwest Laboratory for arsenic speciation analysis demonstrated that methylated species could be detected reliably by hydride generation/atomic absorption spectroscopy. The hydride generation method is more reliable because it avoids ionic exchange interferences characteristic of complex aqueous matrices. Therefore, samples collected during the metals mobility study were submitted for arsenic speciation analysis at Battelle.

Methods of sample collection, preservation, and analytical technique were based on discussion with Battelle's analytical chemistry department. Samples were filtered, collected in dark glass bottles under zero headspace conditions, stored on ice at 4 ± 2 °C, and shipped immediately to Battelle Northwest Laboratories (Sequim, WA) for analysis of As(III),

As(V), MMAA, and DMAA. To avoid altering the oxidation state of the inorganic arsenic species, and because of the frothing of ground water upon acidification, samples were not acidified.

At the Battelle laboratory, arsenate, arsenite, methylarsonic acid (MMAA), and dimethylarsinic acid (DMAA) were volatilized from solution at a specific pH after reduction to the corresponding arsines with sodium borohydride (total arsenic at a pH of < 1, arsenic (III) species at a pH of 5-7, and arsenic (V) by difference). The volatilized arsines were swept onto a liquid nitrogen–cooled chromatographic trap, which upon warming allowed for separation of species based on boiling points. The released arsines were then swept by helium carrier gas into a quartz cuvette burner cell, where they were decomposed to atomic arsenic, the concentrations of which were determined by atomic absorption spectroscopy with a reported method detection limit of 0.1 μg/l.

Hexavalent Chromium: Analytical Procedure

The work plan proposed field analysis for hexavalent chromium using a colorimetric reaction with diphenylcarbazide in acid solution (Deyong et al. 1990; detection limit = 5 μg/l). A field method was proposed because it ensured that the samples would be analyzed within the required 24 hr holding time. However, the colorometric method is subject to potential interferences in waters having visible color even after filtering (e.g., the waters immediately down gradient of the hide piles having over 250 mg/l DOC). Prior to initiating the metals mobility field work, Skinner and Sherman Laboratories (Waltham, MA) was identified as a facility with the ability to analyze samples for Cr(VI) analysis by SW846 method 7179 within the 24-hour holding time. This method involves extraction of Cr(VI) and is thus less prone to matrix interference. Consequently, Cr(VI) determinations were made using this more reliable procedure.

Samples of filtered water were placed in acid-washed glass containers, stored at 4°C, and shipped to Skinner and Sherman Laboratories for immediate analysis. Method 7197 involves chelation of Cr(VI) with ammonium pyrrolidine dithiocarbamate, extraction into methyl isobutyl ketone, and analysis by atomic absorption spectroscopy. Total chromium was analyzed separately with the target-analyte-list metals, allowing Cr(III) to be determined by difference between total Cr and Cr(VI).

Iron: Analytical Procedure

At neutral pH values, Fe(II) reacts rapidly with oxygen to form $Fe(OH)_{3(s)}$ (Sung and Morgan, 1980). Consequently, ground-water sampling was designed to prevent aeration of the sample prior to DO measurement. Ground water was collected with a peristaltic pump, passed through a 0.5-μm in-line filter, and pumped directly from the impermeable tubing into the bottom of a 300-ml glass beaker. The beaker was allowed to overflow twice its volume before a sample was collected to avoid oxygenation of the sample. The sample for analysis was collected directly into the HACH Accuvac vial from the bottom of the beaker, in accordance with the HACH method for Fe(II) determination. If sample dilution was required, the desired sample volume was collected in an adjustable pipette diluted with deionized water, and immediately drawn into the Accuvac vial for analysis. If the volumetric measurement, dilution, and placement in the Accuvac vial was completed in under 15 seconds, no detectable loss in Fe(II) concentration [by oxidation to Fe (III)] occurred even without the use of de-aerated water in the dilution. All Fe(II) analyses requiring dilution were thus mixed and added to the stabilizing phenanthroline complex in under 15 seconds.

Fe(II) was determined colorimetrically following complexation by 1,10-phenanthroline. A field HACH DR/100 spectrophotometer was used to quantify dissolved iron-phenanthroline complex. Because the desired chelate forms only with Fe(II), Fe(III) in the sample is not detected. A second aliquot of the sample was analyzed for total iron by the HACH Ferrover method, which uses 1,10-phenanthroline complexation and a strong reducing agent to reduce Fe(III) to Fe(II). Ferric iron content of the original sample is then calculated from the difference between total iron and ferrous iron. Both ferrous and total iron method detection limits were 0.05 mg/l.

Ammonia (NH3), Nitrate (NO3Ä, and Nitrite (NO2Ä: Analytical Procedure

The work plan proposed measurement of NH3 (as NH4+) and NO3Äwith an Orion gas-sensing ion-selective electrode in conjunction with a portable ion-selective meter, and colorimetric measurement of nitrite using HACH AccuVac ampules. As with the Cr(VI) analysis, the proximity of Skinner and Sherman Laboratories made it possible to submit samples to this commercial laboratory and still meet the 48-hour holding time for $NO_2^{Ä}$and

$NO_3^{Ã}$. Samples for NH_4^+ were acidified to pH < 2 with H2SO4 and stored at 4°C. Samples collected for $NO_2^{Ã}$ and $NO_3^{Ã}$ were stored unacidified and submitted daily for analysis to Skinner and Sherman. Nitrate and $NO_2^{Ã}$ were determined by a modified method 353.2 (EPA, 1979). Ammonia was determined by EPA method 350.1 (EPA, 1979).

Sulfide: Analytical Procedure

The work plan proposed measuring sulfide colorimetrically using the HACH method of reacting sulfide with ferric chloride and p-aminodimethylaniline oxalate to produce the dye methylene blue. However, tests on water samples from OW-16 indicated that the color present in some wells, even following filtration, caused unacceptable interferences at the sulfide concentration range thought to exist at the Industriplex site. To minimize analytical interferences, sulfide analysis was conducted in the field using an Orion solid state ion-selective electrode in conjunction with a voltmeter. Although the reported working range of the instrument is 0.003 to 32,000 mg/l, calibration in the field indicated that the practical quantitation range was approximately 1 to 10,000 mg/l.

Immediately upon retrieval of the ground-water sample, an unfiltered aliquot was mixed at a 1:1 ratio with a pH 11 ascorbic acid anti-oxidant buffer, which converted all aqueous sulfide species (H_2S, HS^-, and S^{-2}) into the S^{-2} form and prevented subsequent reactions with atmospheric oxygen. The potentiometric response was recorded when the electrode stabilized (typically after 30 seconds). Calibration was obtained by comparing the sample response to solutions mixed from a HACH standard Na_2S solution. In accordance with the Orion electrode instructions, fresh standards were prepared each day, and calibration for each sample was done by bracketing the observed responses with standards within 4 hours of the sample measurement.

Dissolved Oxygen (DO): Analytical Procedure

The work plan proposed analyzing oxygen using the Winkler or iodometric method (APHA, 1975). This method was selected over an oxygen electrode because of the difficulty in removing oxygen from the sample during electrode measurements. However, since the time of writing the original work plan, flow through cells have become much more widely

accepted as a means of obtaining representative samples of ground water. The acquisition of the flow-through cell for the metals mobility sampling thus allowed dissolved oxygen to be measured more reliably with an oxygen electrode immediately at the well head.

The procedures provided in the Orion dissolved oxygen manual were applied in the field. The electrode was calibrated to atmospheric oxygen immediately prior to each measurement. Experiments with the DO electrode indicated that accurate values were obtained only when the sample water was actively flushed across the membrane surface. This was accomplished by focusing the inflow to the flow-through cell directly onto the oxygen electrode. By measuring dissolved oxygen in a zero-headspace chamber on a stream of water immediately as it flowed from the well, introduction of atmospheric oxygen to the sample was minimized. The detection limit for dissolved oxygen was 0.1 mg/l.

Procedure for Evaluating Organic Speciation of Chromium

Separation of organically-bound and uncomplexed chromium was conducted in the field laboratory using a revision of the method described by Liu and Ingle (1989). The separation is based on the affinity of trivalent Cr(III) for Chelex-100 chelating resin, which removes labile (i.e., uncomplexed or weakly complexed) Cr(III) from solution without significantly removing the organically-bound fractions or Cr(VI). Tests of this method prior to field sampling determined that:

1. A column of Chelex-100 resin (13 cm long, 0.5 cm diameter, identical to the one used in the field) removed 88 percent of labile Cr(III) from a 100-μg/l Cr(III) solution. This column capacity was selected to ensure that the highest ionic strength ground water to be tested (OW-16) would not exceed the column capacity for cation exchange. The absence of 100 percent removal efficiency is likely a combination of analytical uncertainty (effluent concentration was less than 2 times the instrument detection limit) and slow Cr(III) complexation kinetics with the Chelex-100 resin.

2. The same Chelex column removed only 54 percent of Cr(III) when EDTA was present as an organic complexing reagent at the same concentration as the Cr(III) (i.e, 100 μg/l). Increased concentrations of EDTA would have complexed a higher percentage of the Cr(III) and resulted in more complete passage through the Chelex-100 column. This is demonstrated by experiments with fulvic acid/Cr(III) mixtures (James and Bartlett 1983), where stabilization of Cr(III) in solution was found to be enhanced by higher concentrations of the chelating reagent.

3. Eighty-five percent of the Cr(III) in a preliminary sample of OW-16 ground water from the Industriplex Site was not removed from solution by the Chelex column, indicating that the majority of the Cr in the sample was likely present as either Cr(VI) or organically complexed Cr(III).

4. Cr(VI) at 100 μg/l was not measurably removed (detection limit = 10 μg/l) by the Chelex-100 column, demonstrating that Cr(VI) is not attenuated by the resin.

These results are consistent with the findings of Liu and Ingle (1989), which indicated that a Chelex-100 column will selectively remove labile metal cations from ground waters while allowing strongly bound organic complexes to pass.

Filtered and unacidified samples of ground water were brought to the field trailer and passed through a Chelex-100 resin column within 8 hours after collection of the ground-water samples. The sample passed through the column was then acidified and submitted for analysis of total Cr. Total Cr and Cr(VI) were determined from the analysis of metals on the original water sample collected and filtered at the well. The Cr concentration in the Chelex-100 eluent included the Cr(VI) plus the Cr(III) present as strong organic complexes. The concentration of organically complexed Cr(III) was calculated from the total Cr in the column effluent minus the Cr(VI) determined in the original sample.

Alkalinity: Analytical Procedure

The alkalinity was determined following the method of Greenberg et al. (1981). Each sample was titrated with H2SO4 to end points of pH 8.3 (carbonate alkalinity), 4.5 (bicarbonate alkalinity), and 3.8 (organic acids).

Specific Conductance and Temperature: Analytical Procedure

Temperature and specific conductance were measured with an Orion conductivity electrode, model #012210, and dedicated conductivity meter, model #124, in the flow-through cell as described previously.

pH: Analytical Procedure

pH was measured with a glass Orion pH electrode, model #91-57, mounted in the flow-through cell. The electrode was calibrated with Fisher standard buffers pH 4, 7, and 10 to bracket the pH of the sample being measured.

Analytical Procedure for Organic Acids

Samples for organic acids were field filtered through 0.45-μm Millipore filters and collected in pre-cleaned, 250-ml amber glass containers. Samples were cooled to 4°C and shipped unpreserved, overnight, to Huffman Laboratories (Golden, CO) for analysis of dissolved organic fractions following the method of Leenheer (1981). Fractionation of dissolved organic matter is not a standard technique, and as a result, does not have a published holding time. However, the samples were analyzed as rapidly as possible following their receipt by the laboratory. Each analysis required 4 days to complete, and five samples were analyzed per week until all samples were completed. All samples were stored at 4°C until the time of analysis.

Lenheer's method is based on a column separation technique. At low pH, weak acids become protonated and adsorb on a nonpolar resin, while at high pH, weak acids are ionized and pass through the column (Aiken, 1988). The hydrophobic solutes are sorbed and fractionated on nonionic, nonpolar macroreticular resins, while the hydrophilic solutes are sorbed and fractionated by macroreticular ion-exchange resins. The hydrophobic and hydrophilic acids are further fractionated into acid, base, and neutral components using column separation at variable pH. This level of analytical detail was designed to be intermediate between a simple analysis for dissolved organic carbon (DOC) and a full characterization of the metal-binding capacity of the humic material.

Following fractionation, selected hydrophilic acid fractions were analyzed at Huffman Laboratories (Golden, CO) by high-precision liquid chromatography for methanoic, ethanoic, butanoic, pentanoic, and citric acids.

Procedures for Analysis of Aquifer Material

Samples of aquifer material were collected from drill cuttings during the installation of monitoring wells. Samples were collected from below the water table in order to obtain samples that would produce data pertinent to the ground-water transport of metals and organic constituents.

Total Organic Carbon Analytical Procedure

A wet oxidation procedure (Snyder and Trofymow, 1984) was used to determine total organic carbon in the aquifer material. Each sample analyzed by this method required 0.5–2.0 grams of aquifer material, depending on the range of carbon content. Samples were analyzed for total organic carbon at Huffman Laboratories (Golden, Colorado) and Colorado State University Department of Soil Sciences (Fort Collins, CO).

Zero Point of Charge: Analytical Method

Zero point of charge (ZPC) indicates the pH at which a soil sample has no net surface charge. The analysis was proposed originally to evaluate the attenuation capacity of the soil for Cr, but was dropped from the list of analyses because of insufficient sample volume.

Cation Exchange Capacity: Analytical Method

The cation exchange capacity (CEC) was measured using the method of Rhoades (1982) at Hazen Laboratory (Denver, CO). This method involves saturating the cation exchange sites with Na^+, then extracting the Na^+ with Mg^{++} and measuring the amount of Na^+ removed. CEC is a property of the mineral grain surfaces; it is not affected by mixing of the soil and thus does not require collection of an undisturbed sample. Samples of drill cuttings were collected from below the water table, and water allowed to drain freely prior to analysis. CEC is not a standard method, and no standard holding time or preservation has been established. However, samples were stored in air-tight containers prior to analysis to prevent changes in the surface characteristics that might result from oxidation.

Soil Mineralogy: Analytical Procedures

Electron Microprobe–The microprobe analyses were conducted using a JEOL 8600 microprobe in the wavelength-dispersive mode at the University of Colorado Department of Geological Sciences (Boulder, CO). A sample of aquifer material was set in an epoxy matrix, hardened, and polished. The electron microprobe focuses a 1 μm diameter electron beam on the area of interest. Wavelength-dispersive and energy-dispersive analyses of the fluorescent x-rays emitted by the sample provide an elemental composition, and subsequently, the stoichiometry of the target solid. In addition, this method is capable of identifying physical relations (e.g., rinding or encapsulation of solids containing the metals of interest.

XRD–X-ray diffraction was proposed as a method for determining the mineral content of the soil matrix. However, XRD is not able to detect minerals present at below approximately 5 percent (w/w) in a sample. The microprobe analyses demonstrated that the metals of interest (i.e., Cr and As) were below method detection limits so no XRD analyses were undertaken.

Physical Soil Parameters

The planned physical characteristics included bulk density, porosity, particle size distribution, and hydraulic conductivity, as input to any future fate and transport computer modeling. However, the drill rig on site during the metals mobility study was selected for its ability to install monitoring wells and was not equipped to collect intact soil samples (e.g., with a Shelby tube or lined split spoon sampler). Disturbed sample of aquifer material were thus obtained from the drill cuttings. As a result, the analyses requiring intact samples (i.e., bulk density, porosity, and hydraulic conductivity) were not conducted. These data will be collected at a future date if necessary.

The particle size distribution (the percentage of clay, silt, and sand in the aquifer material) does not require an intact sample and was determined by drying the aquifer material and passing it through a series of sieves to determine coarse sand (<0.81 mm), coarse to fine sand (0.81–0.061 mm), coarse silt (0.061–0.038 mm), and silt and clay (<0.038 mm). The weight of each size fraction was reported relative to the total mass of material.

Microbiological Plate Counts

The number of bacteria in the samples was measured by viable plate count, a common procedure to enumerate living bacterial cells (Atlas et al. 1988). Two grams of the Halls Brook Holding Area sediment samples were mixed with 10 ml sterile mineral salts medium and vigorously shaken (circular motion) on an Orbit Shaker (Lab-Line Instruments, Inc., Model 3520) at 350 rpm for 30 minutes in order to desorb bacteria from the sludge particles. Then 1-ml samples were serially diluted to a final dilution of 10^{-7} in increments of 10^{-1}. Sterile buffered mineral salt (MS) medium was used for dilution in order to prevent osmolytic effects on the cells. All analyses were initiated within three days of sample collection. In the interim samples were stored in the dark at 7°C.

a). **Spread Plates on Tryptic Soy Agar**
0.1-mL portions of each dilution were aseptically spread out on separate tryptic soy (soybean casein digest, dehydrated, Difco) agar plates. Instead of the usual 30 g/L of tryptic soy broth, only 6 g/L were used to allow growth of organisms that may not be accustomed to rich nutritional conditions. The bacterial colonies on the plates were counted after 2, and again after 4 days of incubation at 24 °C. It was assumed that each colony forming unit (cfu) represents the progeny of a single cell. Therefore, by counting the number of colonies and accounting for the dilution factor, the number of bacteria in the samples could be calculated.

b). **Screening for Benzene–Degrading Bacteria**
In a second series of experiments, serial dilutions of three sediment samples, collected from the northern third of Halls Brook Holding Area at 7 cm, 32 cm, and 50 cm below the sediment/water interface, were assayed for the presence of bacteria able to utilize the aromatic hydrocarbon benzene as their sole source of carbon and energy. Benzene (thiophene free) was purchased from Fisher Scientific Company (Fair Lawn, New Jersey, USA). The samples were spread on MS medium solidified with 1.5 percent purified agar (Difco Laboratories, Detroit Michigan). 100 mg benzene per liter agar were added to a small depression in the solidified agar. It was found to be impossible to disperse benzene in liquid or solid media without high losses of the hydrocarbon due to vaporization effects. Consequently, benzene was provided separately in the vapor phase and allowed to enter the growth medium via diffusion from the vapor. The agar was not analyzed for benzene following the experiment, but the agar at the surface where the bacteria was being grown should be near equilibrium with benzene in the vapor.

All spread plates were kept in a tightly closed jar, and plate counts were made after one week of incubation at room temperature. No physical degradation of the plastic plates was observed. To determine if growth on the plates was due to the benzene and not to agar impurities, control plates were treated in the same way but not exposed to benzene.

APPENDIX A16 REFERENCES

Aiken, R.R., 1988. A critical evaluation of the use of macroporous resins for the isolation of aquatic humic substances. In "Humic Substances and Their Role in the Environment." Frimmel F.H., and Christman R.F., (Editors), John Wiley & Sons. New York. pp. 15–28.

APHA, 1975. Standard methods for the examination of water and wastewater. Fourteenth edition. Franson, M.A., (editor). American Public Health Association, Washington, D.C. 1193 pp.

Atlas et al., 1988.

DeYong, G.D., Bowden, B.K., Harl, R.S., and Anglin, R.J., 1990. Determination of hexavalent chromium in soil samples. Superfund 1990. In "Proceedings of the Eleventh National Conference." Hazardous Materials Control Research Institute, Silver Spring, MD. pp. 1025.

Grabinski, A.A., 1981. Determination of arsenic(III), arsenic(V), monomethylarsonate, and dimethylarsinate by ion-exchange chromatography with flameless atomic absorption spectrometric detection. Anal. Chem. 53,966–968.

Greenberg, A.E., Connors, J.J. and Jenkins D., (editors), 1981. Standard Methods for Examination of Waste and Wastewater. 15th edition. American Public Health Association, Washington, D.C. 1134 pp.

James, B.R., and Bartlett, R.J., 1983. Behavior of chromium in soils: V. Fate of organically complexed Cr(III) added to soil. J. Environ. Qual. 12, 169-172.

Leenheer, J.A., 1981. Comprehensive approach to preparative isolation and fractionation of dissolved organic carbon from natural waters and wastewaters. Environ. Sci. Technol. 15,578–587.

Liu, Y., and Ingle, J.D., 1989. Automated two-column ion exchange system for determination of the speciation of trace metals in natural waters. Anal. Chem. 61, 525–529.

Rhoades, J.D., 1982. Cation Exchange Capacity. Methods of Soil Analysis, Part 2. Chemical and Microbiological Properties. A.L. Page (editor). American Society of Agronomy. Madison, Wisconsin.

Snyder, J.D., and Trofymow, J.A., 1984. A rapid accurate wet oxidation diffusion procedure for determining organic and inorganic carbon in plant and soil samples. Communications in Soil Science and Plant Analysis. 15, 587–597.

Sung, W., and Morgan, J.J., 1980. Kinetics and product of ferrous iron oxygenation in aqueous systems. Env. Sci. and Tech. 14, 561–568.

USEPA, 1979. Methods for Chemical Analysis of Water and Wastes. USEPA/600/4-79-020.

APPENDIX B

Field Documentation and
Chain of Custody Forms

B1 Geologic Logs
B2 Well Construction Logs
B3 Well Survey Coordinate Information
B4 Ground-Water Sampling Logs and Chain of Custody Forms
B5 Surface-Water and Stream-Sediment Sampling Logs and Chain of Custody Forms
B6 Fish Sampling Logs/Chain of Custody

APPENDIX B1

Geologic Logs

ENVIRONMENTAL CONSULTING & MANAGEMENT
ROUX ASSOCIATES, INC.

GEOLOGIC LOG

Study No. 06624Y Date 04/30/92
Project ISRT GSIP Phase 2
Client Industri-Plex Site Remedial Trust
Page 1 of 1
Logged By J. Gerlach
Well/Boring No. OW-37A
Location 8 ft. west of OW-37
M.P. Elevation 71.58 (PVC)
Drilling Started 09/12/91 Ended 09/16/91
Driller D. L. Maher
Type of Rig Mobile B-57 Hollow Stem Auger

WELL DATA

Hole Diam. (in.) 8
Final Depth (ft.) 29.5
Casing Diam. (in.) 2
Casing Length (ft.) 20.88 (2)
Screen Setting (ft.) 29 - 19
Screen Slot & Type PVC 10 Slot
Well Status Monitoring

G-W READINGS (1)

Date	DTW MP (2)	Elev. W.S
12/18/91	5.05	66.53
01/14/92	6.22	65.36
02/19/92	6.86	64.72
03/21/92	6.62	64.96

SAMPLER

Type None
Hammer N/A lb.
Fall N/A in.

DEVELOPMENT

Surged and pumped well on 09/23/91 and 12/12/91. Total 350 gallons removed.

PID (ppm)	SAMPLE No.	Rec.	Depth	Blows 6	Strata Change & Gen. Desc.	Depth (ft)	SAMPLE DESCRIPTION(3)
						0	SEE LOG FOR WELL OW-37.
						2	
						4	
						6	
						8	
						10	
						12	
						14	
						16	
						18	

REMARKS
(1) in feet relative to a common datum
(2) from top of PVC casing
(3) logged cuttings

CONSULTING GROUND WATER GEOLOGISTS
ROUX ASSOCIATES INC

GEOLOGIC LOG

Study No. 16101Y Date 9/20/90
Project Industri-Plex Site
Client Golder Associates
Page 1 Of 1
Logged By H. Gregory
Well No. OW-37
Loc. Woburn, Mass
M.P. Elevation 72.60'
Drilling Started 9/20/90 Ended
Driller D.L. Maher Company
Type Of Rig Hollow Stem Auger

WELL DATA

Hole Diam. (in.) 10"
Final Depth (ft.) 15.72
Casing Diam. (in.) 4
Casing Length (ft.) 7.98'
Screen Setting (ft.) 5.52-15.72
Screen Slot & Type 10 slot PVC
Well Status

G W READINGS(1)

Date	DTW MP(2)	Elev. W.T.

SAMPLER

Type split spoon
Hammer 140 lb.
Fall 30 in.

DEVELOPMENT

HNU	SAMPLE No.	Rec.	Depth (ft.)	Blows/6"	Strata Change & Gen. Desc.	Depth (ft.)	SAMPLE DESCRIPTION
0.0		1.0	0-2'	2,3,3,4	OL	0	Top 0.6': Brown organic SILT Bottom 0.4': sand and cinder; wet at tip.
0.0		1.0	5-7'	1,1,1,3	CL SW	5	Top 0.2': Light grey soft clay. Bottom 0.8': Black to brown medium SAND, fining downward; wet.
0.0		2.0	10-12'	5,9,9,18	SW	10	Top 1.2': brown medium SAND. Bottom 0.8': brown fine SAND, well sorted.
0.0		1.0	15-16.5'	4,17,80	SW SP	15	Top 0.5': Brown fine SAND. Bottom 0.5': Brown medium SAND, some coarse angular gravel.
0.0		1.0	20-22'	15,40,60,53	SP	20	Top 0.5': Brown to red brown medium to coarse SAND, some fine gravel. Bottom 0.5': Red brown medium to coarse Sand and fine to coarse angular gravel.
0.0		0.8	25-27'	4,14,45,80	SP	25	Brown medium to fine SAND some coarse gravel, little silt, very tight; wet, poorly sorted.
		3.0	31.3-34.3	100%recovery	Bedrock	30	Auger refusal at 29.5' (bedrock) Grey green medium grain Gabbro oblique and horizontal fractures filled with sand, weathered bedrock

REMARKS: (1) in feet relative to a common datum
(2) from top of PVC casing

ENVIRONMENTAL CONSULTING & MANAGEMENT
ROUX ASSOCIATES, INC.

GEOLOGIC LOG

Study No. 06624Y Date 04/30/92
Project ISRT GSIP Phase 2
Client Industri-Plex Site Remedial Trust
Page 1 of 2
Logged By M. Smith
Well/Boring No. OW-51B
Location Northwest of arsenic pit
M.P. Elevation 72.60
Drilling Started 11/15/91 Ended 11/20/91
Driller D.L. Maher
Type of Rig Barber Rig

WELL DATA
Hole Diam. (in.) 10, 6
Final Depth (ft.) 85.2
Casing Diam. (in.) 6
Casing Length (ft.) 40.1
Screen Setting (ft.) 37 - 85.2
Screen Slot & Type Open hole
Well Status Bedrock monitoring

G-W READINGS (1)

Date	DTW MP (2)	Elev. W.S

SAMPLER
Type None
Hammer NA lb.
Fall NA in.

DEVELOPMENT
Poor producer - not developed.

PID (ppm)	SAMPLE No.	Rec.	Depth	Blows 6	Strata Change & Gen. Desc.	Depth (ft)	SAMPLE DESCRIPTION(3)
					FILL	0	Logged from cuttings; see geologic log for OW-37 for more complete description of overburden. 0 - 5': FILL, rubble.
					SAND		5 - 20': SAND; gray/brown; flowing.
						10	
						20	20 - 30': Brown\tan flowing SAND.
						30	30 - 34': Broken up rock; sand and gravel mixed in.
					Weathered BEDROCK		34 - 35': Weathered BEDROCK (dark gray meta-gabbro).
					BEDROCK		35 - 85': BEDROCK; dark gray meta-gabbro.
						40	40 - 41': Fractures.
							48 - 50': Fractures.
						50	
							59 - 59.5': Fractures.
						60	
						70	72 - 73.5': Fractures

REMARKS (1) in feet relative to a common datum
(2) from top of PVC casing
(3) logged cuttings

ENVIRONMENTAL CONSULTING & MANAGEMENT
ROUX ASSOCIATES, INC.

GEOLOGIC LOG

Study No. 06624Y Date 04/30/92
Project ISRT GSIP Phase 2
Client Industri-Plex Site Remedial Trust
Page 2 of 2
Logged By M. Smith
Well/Boring No. OW-51B
Location Northwest of arsenic pit
M.P. Elevation 72.60
Drilling Started 11/15/91 Ended 11/20/91
Driller D.L. Maher
Type of Rig Barber Rig

WELL DATA
Hole Diam. (in.) 10, 6
Final Depth (ft.) 85.2
Casing Diam. (in.) 6
Casing Length (ft.) 40.1
Screen Setting (ft.) 37 - 85.2
Screen Slot & Type Open hole
Well Status Bedrock monitoring

G-W READINGS (1)

Date	DTW MP (2)	Elev. W.

SAMPLER
Type None
Hammer NA lb.
Fall NA in.

DEVELOPMENT
Poor producer - not developed.

PID (ppm)	SAMPLE No.	Rec.	Depth	Blows 6	Strata Change & Gen. Desc.	Depth (ft)	SAMPLE DESCRIPTION
						80	82- 82.5': Fractures.
					Bottom of Boring 85'		Bottom of boring 85'.
						90	
						100	
						110	
						120	
						130	
						140	
						150	

REMARKS (1) in feet relative to a common datum
(2) from top of PVC casing
(3) logged cuttings

ENVIRONMENTAL CONSULTING & MANAGEMENT
ROUX ASSOCIATES, INC.

GEOLOGIC LOG

Study No. 06624Y Date 04/30/92
Project ISRT GSIP Phase 2
Client Industri-Plex Site Remedial Trust
Page 1 of 1
Logged By D. Aschman
Well/Boring No. OW-52A
Location Off west end of Atlantic Avenue.
M.P. Elevation 69.22 (PVC)
Drilling Started 09/19/91 Ended 09/19/91
Driller D. L. Maher
Type of Rig Mobile B-57 Hollow Stem Auger

WELL DATA

Hole Diam. (in.) 8
Final Depth (ft.) 11.7
Casing Diam. (in.) 2
Casing Length (ft.) 7.42 (2)
Screen Setting (ft.) 5.5 - 10.5
Screen Slot & Type PVC 10 Slot
Well Status Monitoring

G-W READINGS (1)

Date	DTW MP (2)	Elev. W.S
12/10/91	9.67	59.55
01/13/92	10.30	58.92
02/20/92	11.04	58.18
03/19/92	10.18	59.04

SAMPLER

Type None
Hammer N/A lb.
Fall N/A in.

DEVELOPMENT

Surged and pumped on 12/10/91. Poor producer. Total 5 gallons removed.

PID (ppm)	SAMPLE No.	Rec.	Depth	Blows 6	Strata Change & Gen. Desc.	Depth (ft)	SAMPLE DESCRIPTION(3)
NA			0 - 2		TILL	0	Brown medium to coarse SAND with coarse gravel, cobbles, bolders.
						2	
			3		SAND		Dark brown medium to coarse SAND. Odor.
						4	
			5		Hides/Odor		Black sand with decaying hides. Odor.
					WATER TABLE (approx.)	6	Damp at 6 ft.
			8			8	Black fine muck (decayed hides). Wet.
					Bottom of Boring 11.7 ft.	10	Bottom of boring 11.7.
						12	
						14	
						16	
						18	

REMARKS
(1) in feet relative to a common datum
(2) from top of PVC casing
(3) logged cuttings

ENVIRONMENTAL CONSULTING & MANAGEMENT
ROUX ASSOCIATES, INC.

GEOLOGIC LOG

Study No. 06624Y Date 04/30/92
Project ISRT GSIP Phase 2
Client Industri-Plex Site Remedial Trust
Page 1 of 1
Logged By D. Aschman
Well/Boring No. OW-52B
Location Off west end of Atlantic Avenue.
M.P. Elevation 69.05 (PVC)
Drilling Started 09/19/91 Ended 09/19/91
Driller D. L. Maher
Type of Rig Mobile B-57 Hollow Stem Auger

WELL DATA

Hole Diam. (in.) 8
Final Depth (ft.) 17.3
Casing Diam. (in.) 2
Casing Length (ft.) 12.95 (2)
Screen Setting (ft.) 11.5 - 16.5
Screen Slot & Type PVC 10 Slot
Well Status Monitoring

G-W READINGS (1)

Date	DTW MP (2)	Elev. W.S
12/10/91	9.55	59.50
01/13/92	11.20	57.85
02/20/92	11.04	58.01
03/19/92	7.12	51.88

SAMPLER

Type None
Hammer N/A lb.
Fall N/A in.

DEVELOPMENT

Surged and pumped on 12/10/91. Poor producer. Total 8 gallons removed.

PID (ppm)	SAMPLE No.	Rec.	Depth	Blows 6	Strata Change & Gen. Desc.	Depth (ft)	SAMPLE DESCRIPTION(3)
			0 - 3		TILL	0	Brown medium SAND with gravel and cobbles, trace silt.
						2	
			3 - 5		HIDES ODOR		Black medium SAND with patches of hair. Odor.
						4	
			6				Moist.
						6	
			7		WATER TABLE (approx.)		Fine black muck (degrading hides) with patches of hair. Damp. Slight odor.
						8	
						10	
			12		SAND		Black stained fine to medium SAND. Odor. Wet.
						12	
			13.5				Black fine sand with silt and clay. Cohesive, liquifies easily.
						14	
						16	
					BEDROCK at 17.3'		Bottom of boring - 17.3'.
						18	

REMARKS (1) in feet relative to a common datum
(2) from top of PVC casing
(3) logged cuttings

ENVIRONMENTAL CONSULTING & MANAGEMENT
ROUX ASSOCIATES, INC.

GEOLOGIC LOG

Study No. 06624Y Date 04/30/92
Project ISRT GSIP Phase 2
Client Industri-Plex Site Remedial Trust
Page 1 of 1
Logged By M. Smith
Well/Boring No. OW-53B
Location Off west end of Atlantic Avenue
M.P. Elevation 70.33
Drilling Started 11/21/91 Ended 11/23/91
Driller D.L. Maher
Type of Rig Barber Rig

WELL DATA
Hole Diam. (in.) 10
Final Depth (ft.) 78.9
Casing Diam. (in.) 6
Casing Length (ft.) 34.43 (2)
Screen Setting (ft.) 31.5 - 78.9
Screen Slot & Type Open hole
Well Status Bedrock monitoring

G-W READINGS (1)

Date	DTW MP (2)	Elev. W.S

SAMPLER
Type None
Hammer NA lb.
Fall NA in.

DEVELOPMENT
Poor producer - not developed.

PID (ppm)	SAMPLE No.	Rec.	Depth	Blows 6	Strata Change & Gen. Desc.	Depth (ft)	SAMPLE DESCRIPTION(3)
					SAND	0	Logged from cuttings. 0 - 13': Black; medium-fine; SAND; odoriferous.
						10	13 - 19.5': Grey; fine; SAND.
					Weathered BEDROCK	20	20 - 26': Broken up rock.
					BEDROCK		26 - 79': Bedrock.
						30	
						40	
							48 - 49': Fractures.
						50	52 - 52.5': Fractures.
							57 - 58': Fractures.
						60	
						70	
					Bottom of Boring 78.9		Bottom of boring 78.9'.

REMARKS (1) in feet relative to a common datum
(2) from top of PVC casing
(3) logged cuttings

ENVIRONMENTAL CONSULTING & MANAGEMENT
ROUX ASSOCIATES, INC.

GEOLOGIC LOG

Study No. 06624Y Date 04/30/92
Project ISRT GSIP Phase 2
Client Industri-Plex Site Remedial Trust
Page 1 of 1
Logged By D. Aschman
Well/Boring No. OW-54A
Location South of South Hide Pile
M.P. Elevation 64.02 (PVC)
Drilling Started 09/18/91 Ended 09/18/91
Driller D. L. Maher
Type of Rig Mobile B-57 Hollow Stem Auger

WELL DATA

Hole Diam. (in.) 8
Final Depth (ft.) 13
Casing Diam. (in.) 2
Casing Length (ft.) 5.32 (2)
Screen Setting (ft.) 4 - 12
Screen Slot & Type PVC 10 Slot
Well Status Monitoring

G-W READINGS (1)

Date	DTW MP (2)	Elev. W
01/13/92	8.14	55.88
02/19/92	7.56	56.46
03/19/92	8.23	55.79

SAMPLER

Type None
Hammer N/A lb.
Fall N/A in.

DEVELOPMENT

Surged and pumped on 09/20/91. Total 80 gallons removed.

PID (ppm)	SAMPLE No.	Rec.	Depth	Blows 6	Strata Change & Gen. Desc.	Depth (ft)	SAMPLE DESCRIPTION(3)
			0 - 5'		SAND	0	Logged from cuttings; See geologic log for OW-54C for more complete description. Yellow-brown fine SAND, trace fine gravel, trace silt.
			8		Stained SAND	8	Dark brown fine-medium SAND. No odor.
			11 - 13			12	Grey medium-coarse SAND, little gravel. Little staining, no odor.
					Bottom of Boring 13'	14	Bottom of boring 13'.

REMARKS
(1) in feet relative to a common datum
(2) from top of PVC casing
(3) logged cuttings

ENVIRONMENTAL CONSULTING & MANAGEMENT
ROUX ASSOCIATES, INC.

GEOLOGIC LOG

Study No. 06624Y Date 04/30/92
Project ISRT GSIP Phase 2
Client Industri-Plex Site Remedial Trust
Page 1 of 2
Logged By D. Aschman
Well/Boring No. OW-54B
Location South of South Hide Pile
M.P. Elevation 64.28 (PVC)
Drilling Started 09/18/91 Ended 09/18/91
Driller D. L. Maher
Type of Rig Mobile B-57 Hollow Stem Auger

WELL DATA

Hole Diam. (in.) 8
Final Depth (ft.) 25.5
Casing Diam. (in.) 2
Casing Length (ft.) 25.18 (2)
Screen Setting (ft.) 13.7-23.7
Screen Slot & Type PVC 10 Slot
Well Status Monitoring

G-W READINGS (1)

Date	DTW MP (2)	Elev. W.S.
01/13/92	8.34	55.94
02/19/92	6.73	57.55
03/19/92	8.02	56.26

SAMPLER

Type None
Hammer N/A lb.
Fall N/A in.

DEVELOPMENT

Surged and pumped on 09/20/91. Total 135 gallons removed.

PID (ppm)	SAMPLE No.	Rec.	Depth	Blows 6	Strata Change & Gen. Desc.	Depth (ft)	SAMPLE DESCRIPTION(3)
			0 - 5'		SAND	0	Logged from cuttings; see geologic log for OW-54C for more complete description. Yellow-brown fine to medium SAND, little gravel.
						2	
						4	
			6		Stained SAND	6	Dark brown medium to coarse SAND, moist.
						8	
					WATER TABLE (approx.)		
			10		ODOR	10	Dark brown, medium-coarse SAND, little silt; trace gravel, wet, odor.
						12	
						14	
			15				Grey medium SAND, little clay. Slight odor.
						16	
						18	

REMARKS
(1) in feet relative to a common datum
(2) from top of PVC casing
(3) logged cuttings

ENVIRONMENTAL CONSULTING & MANAGEMENT
ROUX ASSOCIATES, INC.

GEOLOGIC LOG

Study No. 06624Y Date 04/30/92
Project ISRT GSIP Phase 2
Client Industri-Plex Site Remedial Trust
Page 2 of 2
Logged By D. Aschman
Well/Boring No. OW-54B
Location South of South Hide Pile
M.P. Elevation 64.28 (PVC)
Drilling Started 09/18/91 Ended 09/18/91
Driller D. L. Maher
Type of Rig Mobile B-57 Hollow Stem Auger

WELL DATA

Hole Diam. (in.) 8
Final Depth (ft.) 25.5
Casing Diam. (in.) 2
Casing Length (ft.) 25.18 (2)
Screen Setting (ft.) 13.7-23.7
Screen Slot & Type PVC 10 Slot
Well Status Monitoring

G-W READINGS (1)

Date	DTW MP (2)	Elev. W
01/13/92	8.34	55.94
02/19/92	6.73	57.55
03/19/92	8.02	56.26

SAMPLER

Type None
Hammer N/A lb.
Fall N/A in.

DEVELOPMENT

Surged and pumped on 09/20/91. Tota
135 gallons removed.

PID (ppm)	SAMPLE No.	Rec.	Depth	Blows 6	Strata Change & Gen. Desc.	Depth (ft)	SAMPLE DESCRIPTION(3)
			20'			20	Grey-black medium SAND. Rich peaty odor.
						22	
						24	
						26	
					Bottom of Boring 27.5'		Bottom of boring 27.5', but collapses to 25.5' when drilling stops.
						28	
						30	
						32	
						34	
						36	
						38	

REMARKS
(1) in feet relative to a common datum
(2) from top of PVC casing
(3) logged cuttings

ENVIRONMENTAL CONSULTING & MANAGEMENT
ROUX ASSOCIATES, INC.

GEOLOGIC LOG

Study No. 06624Y Date 04/30/92
Project ISRT GSIP Phase 2
Client Industri-Plex Site Remedial Trust
Page 1 of 3
Logged By D. Aschman
Well/Boring No. OW-54C
Location South of South Hide Pile
M.P. Elevation 64.33 (PVC)
Drilling Started 09/16/91 Ended 09/17/91
Driller D. L. Maher
Type of Rig Mobile B-57 Hollow Stem Auger

WELL DATA

Hole Diam. (in.) 8
Final Depth (ft.) 47.5
Casing Diam. (in.) 2
Casing Length (ft.) 46.63 (2)
Screen Setting (ft.) 40 - 45
Screen Slot & Type PVC 10 Slot
Well Status Monitoring

G-W READINGS (1)

Date	DTW MP (2)	Elev. W.S
01/13/92	8.24	56.09
02/19/92	8.02	56.31
03/19/92	8.33	56.00

SAMPLER

Type Split spoon
Hammer 140 lb.
Fall 30 in.

DEVELOPMENT

Surged and pumped on 09/20/91. Total 85 gallons removed.

PID (ppm)	SAMPLE No.	Rec.	Depth	Blows 6	Strata Change & Gen. Desc.	Depth (ft)	SAMPLE DESCRIPTION
	1	1.0	0 - 2'	10,10,16,32	SAND	0	Brown, medium to fine SAND, some silt and fine gravel, dry.
	2	1.3	2 - 4'	14,16,24,30		2	Yellow-brown medium to fine SAND, some silt and fine gravel, moist.
	3	1.4	4 - 6'	11,18,15,14		4	Yellow-brown medium to fine SAND, some silt and fine gravel, moist.
	4	0.5	6 - 8'	8,8,8,9		6	Yellow-brown medium to coarse SAND, some silt and fine gravel, moist. ½" layer dark brown fine sand with odor.
	5	1.0	8 - 10'	7,17,22,24	WATER TABLE (approx.)	8	Grey-brown fine SAND, some silt. Layers of orange and black staining. Wet.
	6	1.5	10 - 12'	7,20,28,26		10	Same, grading to black medium to coarse SAND with dark orange mottling. Wet.
						12	
	7	1.2	13 - 15'	2,2,5,5			Black fine SAND, wet.
						14	
	8	1.5	15 - 17'	6,6,8,8	ODOR		Black fine SAND, odor of organic decay (hides).
						16	
	9	0.3	18 - 20'	4,3,6,8		18	Black fine-medium SAND, trace silt.

REMARKS (1) in feet relative to a common datum
(2) from top of PVC casing

ENVIRONMENTAL CONSULTING & MANAGEMENT
ROUX ASSOCIATES, INC.

GEOLOGIC LOG

Study No. 06624Y Date 04/30/92
Project ISRT GSIP Phase 2
Client Industri-Plex Site Remedial Trust
Page 2 of 3
Logged By D. Aschman
Well/Boring No. OW-54C
Location South of South Hide Pile.
M.P. Elevation 64.33 (PVC)
Drilling Started 09/16/91 Ended 09/17/91
Driller D. L. Maher
Type of Rig Mobile B-57 Hollow Stem Auger

WELL DATA

Hole Diam. (in.) 8
Final Depth (ft.) 47.5
Casing Diam. (in.) 2
Casing Length (ft.) 46.63 (2)
Screen Setting (ft.) 40 - 45
Screen Slot & Type PVC 10 Slot
Well Status Monitoring

G-W READINGS (1)

Date	DTW MP (2)	Elev. W.
01/13/92	8.24	56.09
02/19/92	8.02	56.31
03/19/92	8.33	56.00

SAMPLER

Type Split spoon
Hammer 140 lb.
Fall 30 in.

DEVELOPMENT

Surged and pumped on 09/20/91. Total 85 gallons removed.

PID (ppm)	SAMPLE No.	Rec.	Depth	Blows 6	Strata Change & Gen. Desc.	Depth (ft)	SAMPLE DESCRIPTION
	10	1.2	20 - 22'	12,6,9,11		20	Black, medium to coarse SAND, some fine silt, trace fine gravel. Wet. Odor.
						22	
	11	1.4	24 - 46'	7,7,9,11		24	Black fine SAND, micaceous. Wet, odor.
						26	
						28	
	12	1.0	30 - 32'	9,8,10,14		30	Black fine SAND. Wet. Odor.
						32	
	13	1.0	34 - 36'	6,11,11,13	Black silty SAND	34	Black very fine silty SAND. Wet. Odor.
						36	
						38	

REMARKS (1) in feet relative to a common datum
(2) from top of PVC casing

ENVIRONMENTAL CONSULTING & MANAGEMENT
ROUX ASSOCIATES, INC.

GEOLOGIC LOG

Study No. 06624Y Date 04/30/92
Project ISRT GSIP Phase 2
Client Industri-Plex Site Remedial Trust
Page 3 of 3
Logged By D. Aschman
Well/Boring No. OW-54C
Location South of South Hide Pile.
M.P. Elevation 64.33 (PVC)
Drilling Started 09/16/91 Ended 09/17/91
Driller D. L. Maher
Type of Rig Mobile B-57 Hollow Stem Auger

WELL DATA

Hole Diam. (in.) 8
Final Depth (ft.) 47.5
Casing Diam. (in.) 2
Casing Length (ft.) 46.63 (2)
Screen Setting (ft.) 40 - 45
Screen Slot & Type PVC 10 Slot
Well Status Monitoring

G-W READINGS (1)

Date	DTW MP (2)	Elev. W.S
01/13/92	8.24	56.09
02/19/92	8.02	56.31
03/19/92	8.33	56.00

SAMPLER

Type Split spoon
Hammer 140 lb.
Fall 30 in.

DEVELOPMENT

Surged and pumped on 09/20/91. Total 85 gallons removed.

PID (ppm)	SAMPLE No.	Rec.	Depth	Blows 6	Strata Change & Gen. Desc.	Depth (ft)	SAMPLE DESCRIPTION
	14	2.0	39 - 41'	6,7,10,19		40	Black very fine silty SAND. Wet. Odor.
						42	
	15	1.5	44 - 46'	9,13,15,18	ODOR	44	Black fine SAND, strong odor. Grey fine sandy CLAY.
						46	
					BEDROCK Bottom of boring 47.5'		Bottom of boring 47.5'. Bedrock encountered.
						48	
						50	
						52	
						54	
						56	
						58	

REMARKS (1) in feet relative to a common datum
(2) from top of PVC casing

ENVIRONMENTAL CONSULTING & MANAGEMENT
ROUX ASSOCIATES, INC.

GEOLOGIC LOG

Study No. 06624Y Date 04/30/92
Project ISRT GSIP Phase 2
Client Industri-Plex Site Remedial Trust
Page 1 of 1
Logged By M. Smith
Well/Boring No. OW-55
Location South of South Hide Pile
M.P. Elevation 65.81
Drilling Started 11/26/91 Ended 12/04/91
Driller D.L. Maher
Type of Rig Barber Rig

WELL DATA

Hole Diam. (in.) 10, 6
Final Depth (ft.) 70.1
Casing Diam. (in.) 6
Casing Length (ft.) 61.11
Screen Setting (ft.) 58 - 70
Screen Slot & Type Open hole
Well Status Bedrock monitoring

G-W READINGS (1)

Date	DTW MP (2)	Elev. W.
01/13/92	10.08	55.73
02/19/92	10.22	55.59
03/19/92	9.99	55.82

SAMPLER

Type None
Hammer NA lb.
Fall NA in.

DEVELOPMENT

95 gallons pumped on 12/13/91 - poor producer.

PID (ppm)	SAMPLE No.	Rec.	Depth	Blows 6	Strata Change & Gen. Desc.	Depth (ft)	SAMPLE DESCRIPTION(3)
					SAND	0	Logged from cuttings; see geologic log for OW-54C for more complete description of overburden. 0 - 10': SAND with trace of gravel; brown grading to grey/black.
						10	10 - 46': Black SAND; water at 15'.
					WATER TABLE (approx.)	20	
						30	
						40	
					Weathered BEDROCK	50	46 - 56': Fractured BEDROCK; dark grey and green meta-grabbro.
					BEDROCK	60	56 - 70': BEDROCK; green and grey meta-gabbro.
					Bottom of Boring 70.1'	70	Bottom of boring 70.1'.

REMARKS (1) in feet relative to a common datum
(2) from top of PVC casing
(3) logged cuttings

ENVIRONMENTAL CONSULTING & MANAGEMENT
ROUX ASSOCIATES, INC.

GEOLOGIC LOG

Study No. 06624Y Date 04/30/92
Project ISRT GSIP Phase 2
Client Industri-Plex Site Remedial Trust
Page 1 of 1
Logged By D. Aschman
Well/Boring No. OW-56A
Location NE of Hall's Brook Holding Area.
M.P. Elevation 59.36 (PVC)
Drilling Started 10/23/91 Ended 10/23/91
Driller D. L. Maher
Type of Rig Hollow Stem Auger - BRAT

WELL DATA

Hole Diam. (in.) 8
Final Depth (ft.) 12.5
Casing Diam. (in.) 2
Casing Length (ft.) 4.26 (2)
Screen Setting (ft.) 2.3-12.3
Screen Slot & Type PVC 10 Slot
Well Status Monitoring

G-W READINGS (1)

Date	DTW MP (2)	Elev. W.S
12/11/91	6.85	52.51
01/13/92	7.46	51.90
02/19/92	7.48	51.88
03/20/92	7.53	51.83

SAMPLER

Type None
Hammer N/A lb.
Fall N/A in.

DEVELOPMENT

Surged and pumped on 12/11/91. Total 390 gallons removed.

PID (ppm)	SAMPLE No.	Rec.	Depth	Blows 6	Strata Change & Gen. Desc.	Depth (ft)	SAMPLE DESCRIPTION(3)
						0	Logged from cuttings. For more complete description see geologic log for OW-56C.
						2	
						4	
					SAND/ GRAVEL		Brown coarse SAND and GRAVEL, few cobbles.
						6	
						8	
						10	
						12	
					Bottom of boring 12.5'		Bottom of boring 12.5'.
						14	
						16	
						18	

REMARKS
(1) in feet relative to a common datum
(2) from top of PVC casing
(3) logged cuttings

ENVIRONMENTAL CONSULTING & MANAGEMENT
ROUX ASSOCIATES, INC.

GEOLOGIC LOG

Study No. 06624Y Date 04/30/92
Project ISRT GSIP Phase 2
Client Industri-Plex Site Remedial Trust
Page 1 of 2
Logged By D. Aschman
Well/Boring No. OW-56B
Location NE of Hall's Brook Holding Area
M.P. Elevation 59.00 (PVC)
Drilling Started 10/23/91 Ended 10/23/91
Driller D. L. Maher
Type of Rig Hollow Stem Auger

WELL DATA

Hole Diam. (in.) 8
Final Depth (ft.) 25
Casing Diam. (in.) 2
Casing Length (ft.) 21.0 (2)
Screen Setting (ft.) 19.4 - 24.4
Screen Slot & Type PVC 10 Slot
Well Status Monitoring

G-W READINGS (1)

Date	DTW MP (2)	Elev. W.
12/11/91	7.30	51.70
01/13/92	7.09	51.91
02/19/92	7.02	51.98
03/20/92	7.12	51.88

SAMPLER

Type 2" Split Spoon
Hammer 140 lb.
Fall 30 in.

DEVELOPMENT

Surged and pumped on 12/11/91. Total of 80 gallons removed.

PID (ppm)	SAMPLE No.	Rec.	Depth	Blows 6	Strata Change & Gen. Desc.	Depth (ft)	SAMPLE DESCRIPTION(3)
						0	Logged from cuttings. For more complete description see geologic log for OW-56C.
						2	
						4	
					SAND		Coarse SAND, some gravel.
						6	
						8	
						10	
	1	1.4	12 - 14'			12	Black stained coarse SAND. Little gravel.
						14	
						16	
							Fine silty SAND.
						18	

REMARKS (1) in feet relative to a common datum
(2) from top of PVC casing
(3) logged cuttings

ENVIRONMENTAL CONSULTING & MANAGEMENT
ROUX ASSOCIATES, INC.

GEOLOGIC LOG

Study No. 06624Y Date 04/30/92
Project ISRT GSIP Phase 2
Client Industri-Plex Site Remedial Trust
Page 2 of 2
Logged By D. Aschman
Well/Boring No. OW-56B
Location NE of Hall's Brook Holding Area
M.P. Elevation 59.00 (PVC)
Drilling Started 10/23/91 Ended 10/23/91
Driller D. L. Maher
Type of Rig Hollow Stem Auger

WELL DATA

Hole Diam. (in.) 8
Final Depth (ft.) 25
Casing Diam. (in.) 2
Casing Length (ft.) 21.0 (2)
Screen Setting (ft.) 19.4 - 24.4
Screen Slot & Type PVC 10 Slot
Well Status Monitoring

G-W READINGS (1)

Date	DTW MP (2)	Elev. W.S
12/11/91	7.30	51.70
01/13/92	7.09	51.91
02/19/92	7.02	51.98
03/20/92	7.12	51.88

SAMPLER

Type 2" Split Spoon
Hammer 140 lb.
Fall 30 in.

DEVELOPMENT

Surged and pumped on 12/11/91. Total of 80 gallons removed.

PID (ppm)	SAMPLE No.	Rec.	Depth	Blows 6	Strata Change & Gen. Desc.	Depth (ft)	SAMPLE DESCRIPTION(3)
					SAND	20	Fine silty SAND.
						22	
						24	
					Bottom of boring 25'		Bottom of boring 25'.
						26	
						28	
						30	
						32	
						34	
						36	
						38	

REMARKS (1) in feet relative to a common datum
(2) from top of PVC casing
(3) logged cuttings

ENVIRONMENTAL CONSULTING & MANAGEMENT
ROUX ASSOCIATES, INC.

GEOLOGIC LOG

Study No. 06624Y Date 04/30/92
Project ISRT GSIP Phase 2
Client Industri-Plex Site Remedial Trust
Page 1 of 2
Logged By D. Aschman
Well/Boring No. OW-56C
Location NE of Hall's Brook Holding Area
M.P. Elevation 59.33 (PVC)
Drilling Started 10/21/91 Ended 10/23/91
Driller D. L. Maher
Type of Rig Hollow Stem Auger - BRAT

WELL DATA

Hole Diam. (in.) 8
Final Depth (ft.) 30.8
Casing Diam. (in.) 2
Casing Length (ft.) 27.03 (2)
Screen Setting (ft.) 25.1 - 30.1
Screen Slot & Type PVC 10 Slot
Well Status Monitoring

G-W READINGS (1)

Date	DTW MP (2)	Elev. W.
12/11/91	7.17	52.16
01/13/92	7.45	51.88
02/19/92	7.38	51.95
03/20/92	7.44	51.89

SAMPLER

Type 2"Split Spoon
Hammer 140 lb.
Fall 30 in.

DEVELOPMENT

Surged and pumped on 12/11/91. Total 130 gallons removed.

PID (ppm)	SAMPLE No.	Rec.	Depth	Blows 6	Strata Change & Gen. Desc.	Depth (ft)	SAMPLE DESCRIPTION
	1	1.1	0 - 2'	10,13,14,25	FILL	0	Yellow fine SAND, some gravel. Streaks of brown fine sand.
	2	1.3	2 - 4'	30,55,46,30		2	Light brown fine SAND grading to coarse brown sand and gravel. Few cobbles.
	3	1.2	4 - 6'	8,12,12,24	SAND/ GRAVEL	4	Brown coarse SAND and GRAVEL. Few cobbles. Purple stain on cobble.
	4	0.1	6 - 8'	7,10,10,9	Yellow stain WATER TABLE (approx.)	6	Bright yellow-brown coarse SAND with gravel. Wet at 6 ft., opaque brown water.
	5	1.2	8 - 10'	3,4,6,10	Black stain	8	Coarse brown SAND. 9.2 - 10.0': Heavy black staining.
	6	1.2	10 - 12'	3,5,8,9		10	Black heavily stained coarse SAND, trace gravel.
	7	1.3	12 - 14'	6,22,19,11		12	Black stained medium-coarse SAND, some gravel, few cobbles.
	8	1.1	14 - 16'	3,4,7,8	Very fine Silty SAND	14	Water is opaque grey. 14 - 14.4': Black stained coarse SAND.
	9	1.1	16 - 18'	10,13,7,4		16	Grey fine silty SAND. 16.4 - 18.0': Grey very fine silty SAND.
	10	1.1	18 - 20'	5,5,6,8		18	Grey fine silty SAND. Streaks of black staining.

REMARKS (1) in feet relative to a common datum
(2) from top of PVC casing

ENVIRONMENTAL CONSULTING & MANAGEMENT
ROUX ASSOCIATES, INC.

GEOLOGIC LOG

Study No. 06624Y Date 04/30/92
Project ISRT GSIP Phase 2
Client Industri-Plex Site Remedial Trust
Page 2 of 2
Logged By D. Aschman
Well/Boring No. OW-56C
Location NE of Hall's Brook Holding Area
M.P. Elevation 59.33 (PVC)
Drilling Started 10/21/91 Ended 10/23/91
Driller D. L. Maher
Type of Rig Hollow Stem Auger - BRAT

WELL DATA
Hole Diam. (in.) 8
Final Depth (ft.) 30.8
Casing Diam. (in.) 2
Casing Length (ft.) 27.03 (2)
Screen Setting (ft.) 25.1 - 30.1
Screen Slot & Type PVC 10 Slot
Well Status Monitoring

G-W READINGS (1)

Date	DTW MP (2)	Elev. W.S
12/11/91	7.17	52.16
01/13/92	7.45	51.88
02/19/92	7.38	51.95
03/20/92	7.44	51.89

SAMPLER
Type 2"Split Spoon
Hammer 140 lb.
Fall 30 in.

DEVELOPMENT
Surged and pumped on 12/11/91. Total 130 gallons removed.

PID (ppm)	SAMPLE No.	Rec.	Depth	Blows 6	Strata Change & Gen. Desc.	Depth (ft)	SAMPLE DESCRIPTION
	11	1.0	20 - 22'	8,7,4,6		20	Grey fine silty SAND. 20.8 - 21.2' Dark grey stain, 21.2 - 21.6' black stain.
	12	1.4	22 - 24'	4,10,15,13		22	Grey fine silty SAND, streaks of black stain. 23.8 - 24.0' very fine grey silty sand.
	13	1.2	24 - 26'	6,7,10,15		24	Silty SAND. Grey fine silty SAND.
	14	1.1	26 - 28'	7,12,13,12		26	Grey fine silty SAND.
	15	0.9	28 - 30'	5,22,24,18		28	Grey fine silty SAND.
	16	0.3	30 - 30.8'	40, 100/3"	BEDROCK Bottom of boring 30.8'	30	30.0 - 30.2' Grey fine silty SAND. 30.2 - 30.8' BEDROCK fragments grey/green meta- gabbro.
						32	
						34	
						36	
						38	

REMARKS (1) in feet relative to a common datum
(2) from top of PVC casing

ENVIRONMENTAL CONSULTING & MANAGEMENT
ROUX ASSOCIATES, INC.

GEOLOGIC LOG

Study No. 06624Y Date 04/30/92
Project ISRT GSIP Phase 2
Client Industri-Plex Site Remedial Trust
Page 1 of 1
Logged By M. Smith
Well/Boring No. OW-57
Location NE of Hall's Brook Holding Area
M.P. Elevation 59.36'
Drilling Started 12/06/91 Ended 12/10/91
Driller D.L. Maher
Type of Rig Barber Rig

WELL DATA
Hole Diam. (in.) 10, 6
Final Depth (ft.) 62.8
Casing Diam. (in.) 6
Casing Length (ft.) 54.36 (2)
Screen Setting (ft.) 52 - 62.8
Screen Slot & Type Open hole
Well Status Monitoring

G-W READINGS (1)

Date	DTW MP (2)	Elev. W.

SAMPLER
Type None
Hammer NA lb.
Fall NA in.

DEVELOPMENT
Poor producer - not developed.

PID (ppm)	SAMPLE No.	Rec.	Depth	Blows 6	Strata Change & Gen. Desc.	Depth (ft)	SAMPLE DESCRIPTION(3)
					FILL	0	Logged from cuttings; see geologic log for OW-56C for more complete description of overburden.
							0 - 5': FILL; coarse brown sand and gravel.
					SAND		5 - 12': Gray black coarse SAND.
						10	
					BOULDER		12 - 16': Boulder; black and white grano-diorite.
							16 - 18': Black SAND and gravel.
					SAND	20	18 - 25': Black SAND; grading to silt.
					SILT/CLAY		25 - 38': Black - gray SILT and CLAY.
						30	
					GRAVEL Weathered BEDROCK		38 - 40': GRAVEL; sand & broken up bedrock.
						40	40 - 48': Gray and green meta-gabbro; water produced at 45', possible fractured zone.
					BEDROCK		48- 52': Bedrock; gray and green meta-gabbro.
						50	
						60	
					Bottom of Boring 62.8'		Bottom of boring 62.8'.
						70	

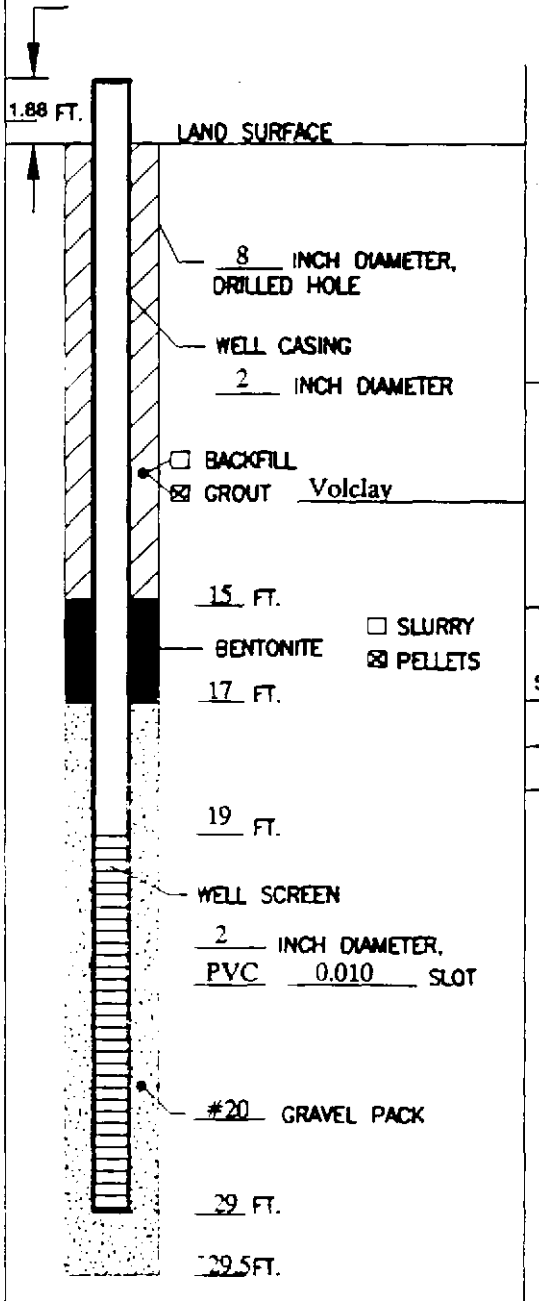
REMARKS (1) in feet relative to a common datum
(2) from top of PVC casing
(3) logged cuttings

APPENDIX B2

Well Construction Logs

ROUX
ROUX ASSOCIATES INC
Environmental Consulting & Management

MONITORING WELL CONSTRUCTION LOG



NOTE:
ALL DEPTHS IN FEET
BELOW LAND SURFACE

PROJECT NAME ISRT GSIP Phase 2 NUMBER 06824Y

WELL NO. OW-37A PERMIT NO. N.A.

TOWN/CITY Woburn

COUNTY Middlesex STATE Massachusetts

LAND SURFACE ELEVATION AND DATUM 69.7 FEET above mean sea level.

☒ SURVEYED ☐ ESTIMATED

INSTALLATION DATE(S) 09/12/91 - 09/16/91

DRILLING METHOD Hollow Stem Auger

DRILLING CONTRACTOR D.L. Maher

DRILLING FLUID Potable water.

DEVELOPMENT TECHNIQUE(S) AND DATE(S)
Surged and pumped on 09/23/91 and 12/12/91.

FLUID LOSS DURING DRILLING NA GALLONS

WATER REMOVED DURING DEVELOPMENT 350 GALLONS

STATIC DEPTH TO WATER 6.22 (01/14/92) FEET BELOW M.P.

PUMPING DEPTH TO WATER NA FEET BELOW M.P.

PUMPING DURATION NA HOURS

YIELD NA GPM NA DATE NA

SPECIFIC CAPACITY NA GPM/FT.

WELL PURPOSE Monitor deeper unconsolidated ground-water conditions.

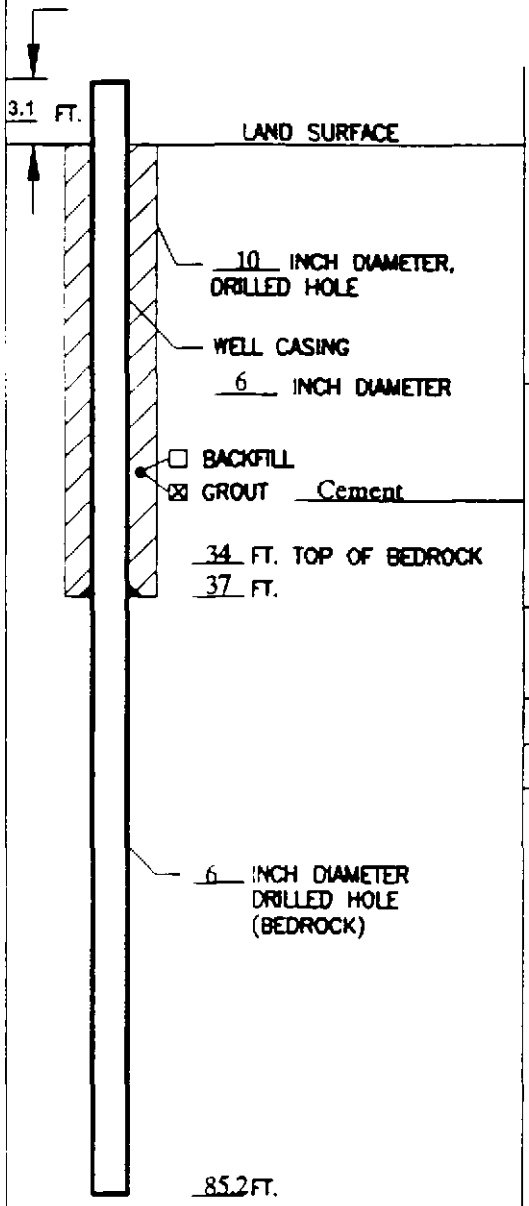
REMARKS Basal unconsolidated well installed as part of OW-37 cluster. Encountered running sand.

Measuring point (M.P.) is top of PVC casing. M.P. elevation is 71.58 feet above mean sea level.

HYDROGEOLOGIST J. Gerlach

ROUX
ROUX ASSOCIATES INC
Environmental Consulting & Management

BEDROCK MONITORING WELL CONSTRUCTION LOG



NOTE:
ALL DEPTHS IN FEET
BELOW LAND SURFACE

PROJECT NAME ISRT GSIP Phase 2 NUMBER 06824Y

WELL NO. OW-51B PERMIT NO. N.A.

TOWN/CITY Woburn

COUNTY Middlesex STATE Massachusetts

LAND SURFACE ELEVATION AND DATUM 69.5 FEET above mean sea level.

☒ SURVEYED ☐ ESTIMATED

INSTALLATION DATE(S) 11/15/91 - 11/20/91

DRILLING METHOD Barber Rig (air hammer/spin casing)

DRILLING CONTRACTOR D.L. Maher

DRILLING FLUID Potable water

DEVELOPMENT TECHNIQUE(S) AND DATE(S)
Poor producer, not enough water to develop.

FLUID LOSS DURING DRILLING NM GALLONS

WATER REMOVED DURING DEVELOPMENT NA GALLONS

STATIC DEPTH TO WATER See remarks FEET BELOW M.P.

PUMPING DEPTH TO WATER NA FEET BELOW M.P.

PUMPING DURATION NA HOURS

YIELD NA GPM NA DATE NA

SPECIFIC CAPACITY NA GPM/FT.

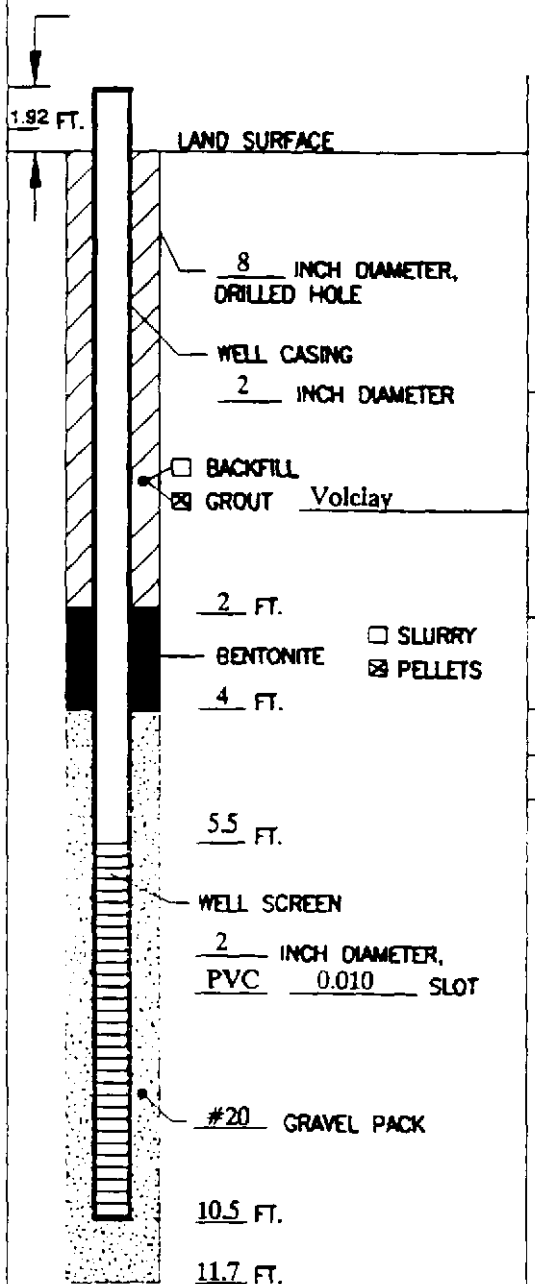
WELL PURPOSE Monitor ground-water in bedrock.

REMARKS Well recovers at extremely slow rate, eg. water elevations measured after well installation were: -13.60' (11/25/91), -6.31' (01/14/92) and 66.39' (02/01/92). Measuring point (M.P.) is top of steel casing. M.P. elevation is 72.60 feet above mean sea level.
Well was abandoned on 02/20/92 by grouting up borehole and cutting casing below grade.
Fracture Zones (determined from change in drilling conditions): 40 - 41'; 48 - 50'; 59 - 59.5'; 72 - 73.5'; 82 - 82.5'.

HYDROGEOLOGIST M. Smith

ROUX
ROUX ASSOCIATES INC
Environmental Consulting & Management

MONITORING WELL CONSTRUCTION LOG



NOTE:
ALL DEPTHS IN FEET
BELOW LAND SURFACE

PROJECT NAME ISRT GSIP Phase 2 NUMBER 06624Y

WELL NO. OW-52A PERMIT NO. N.A.

TOWN/CITY Woburn

COUNTY Middlesex STATE Massachusetts

LAND SURFACE ELEVATION AND DATUM 67.3 FEET above mean sea level.

☒ SURVEYED
☐ ESTIMATED

INSTALLATION DATE(S) 09/19/91

DRILLING METHOD Hollow Stem Auger

DRILLING CONTRACTOR D.L. Maher

DRILLING FLUID Potable water

DEVELOPMENT TECHNIQUE(S) AND DATE(S)
Surged and pumped on 12/10/91. Poor producer.

FLUID LOSS DURING DRILLING NA GALLONS

WATER REMOVED DURING DEVELOPMENT 5 GALLONS

STATIC DEPTH TO WATER 10.30 (01/13/92) FEET BELOW M.P.

PUMPING DEPTH TO WATER NA FEET BELOW M.P.

PUMPING DURATION NA HOURS

YIELD NA GPM NA DATE NA

SPECIFIC CAPACITY NA GPM/FT.

WELL PURPOSE Monitor shallow unconsolidated ground-water conditions.

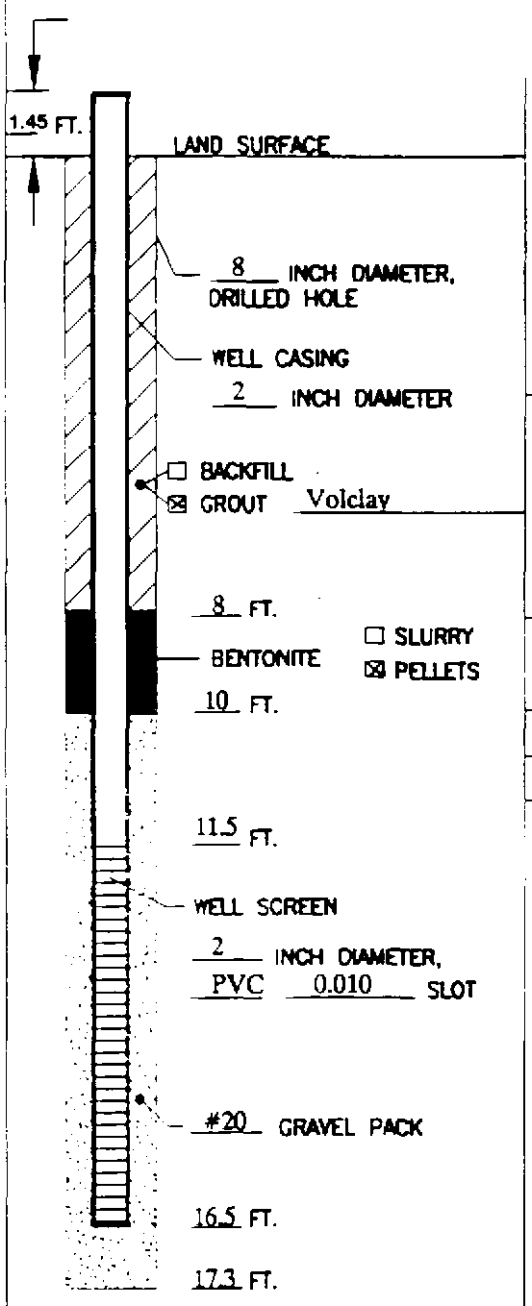
REMARKS Well installed as part of cluster with OW-52B and OW-53B.

Measuring point (M.P.) is top of PVC casing. M.P. elevation is 69.22 feet above mean sea level.

HYDROGEOLOGIST D. Aschman

ROUX ASSOCIATES INC
Environmental Consulting & Management

MONITORING WELL CONSTRUCTION LOG



NOTE:
ALL DEPTHS IN FEET
BELOW LAND SURFACE

PROJECT NAME ISRT GSIP Phase 2 NUMBER 06624Y

WELL NO. OW-52B PERMIT NO. N.A.

TOWN/CITY Woburn

COUNTY Middlesex STATE Massachusetts

LAND SURFACE ELEVATION

AND DATUM 67.8 FEET ☒ SURVEYED ☐ ESTIMATED

above mean sea level.

INSTALLATION DATE(S) 09/19/91

DRILLING METHOD Hollow Stem Auger

DRILLING CONTRACTOR D.L. Maher

DRILLING FLUID Potable water

DEVELOPMENT TECHNIQUE(S) AND DATE(S)

Surged and pumped on 12/10/91. Poor producer.

FLUID LOSS DURING DRILLING N.A. GALLONS

WATER REMOVED DURING DEVELOPMENT 8 GALLONS

STATIC DEPTH TO WATER 11.20 (01/13/92) FEET BELOW M.P.

PUMPING DEPTH TO WATER NA FEET BELOW M.P.

PUMPING DURATION NA HOURS

YIELD NA GPM NA DATE NA

SPECIFIC CAPACITY NA GPM/FT.

WELL PURPOSE Monitor deeper unconsolidated ground-water conditions.

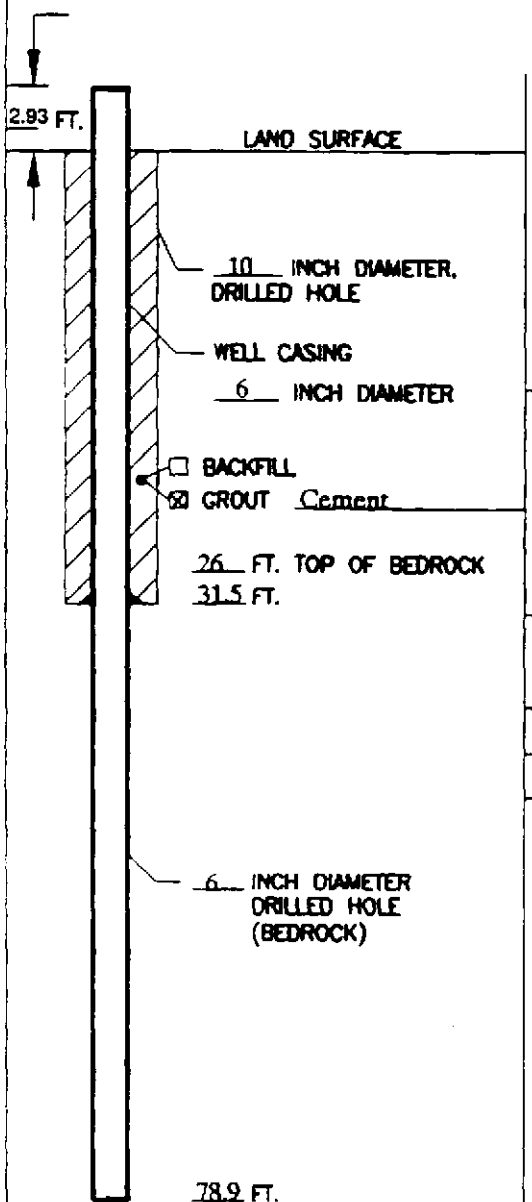
REMARKS Well installed as part of cluster with OW-52A and OW-53B.

Measuring point (M.P.) is top of PVC casing. M.P. elevation is 69.05 feet above mean sea level.

HYDROGEOLOGIST D. Aschman

ROUX ASSOCIATES INC
Environmental Consulting & Management

BEDROCK MONITORING WELL CONSTRUCTION LOG



NOTE:
ALL DEPTHS IN FEET
BELOW LAND SURFACE

PROJECT NAME ISRT GSIP Phase 2 NUMBER 06824Y

WELL NO. OW-53B PERMIT NO. N.A.

TOWN/CITY Woburn

COUNTY Middlesex STATE Massachusetts

LAND SURFACE ELEVATION AND DATUM 67.4 FEET above mean sea level.

☒ SURVEYED ☐ ESTIMATED

INSTALLATION DATE(S) 11/21/91 - 11/23/91

DRILLING METHOD Barber Rig (air hammer/spin casing)

DRILLING CONTRACTOR D.L. Maher

DRILLING FLUID Potable water

DEVELOPMENT TECHNIQUE(S) AND DATE(S)
Poor producer, not enough water to develop.

FLUID LOSS DURING DRILLING NM GALLONS

WATER REMOVED DURING DEVELOPMENT NA GALLONS

STATIC DEPTH TO WATER See remarks FEET BELOW M.P.

PUMPING DEPTH TO WATER NA FEET BELOW M.P.

PUMPING DURATION NA HOURS

YIELD NA GPM NA DATE NA

SPECIFIC CAPACITY NA GPM/FT.

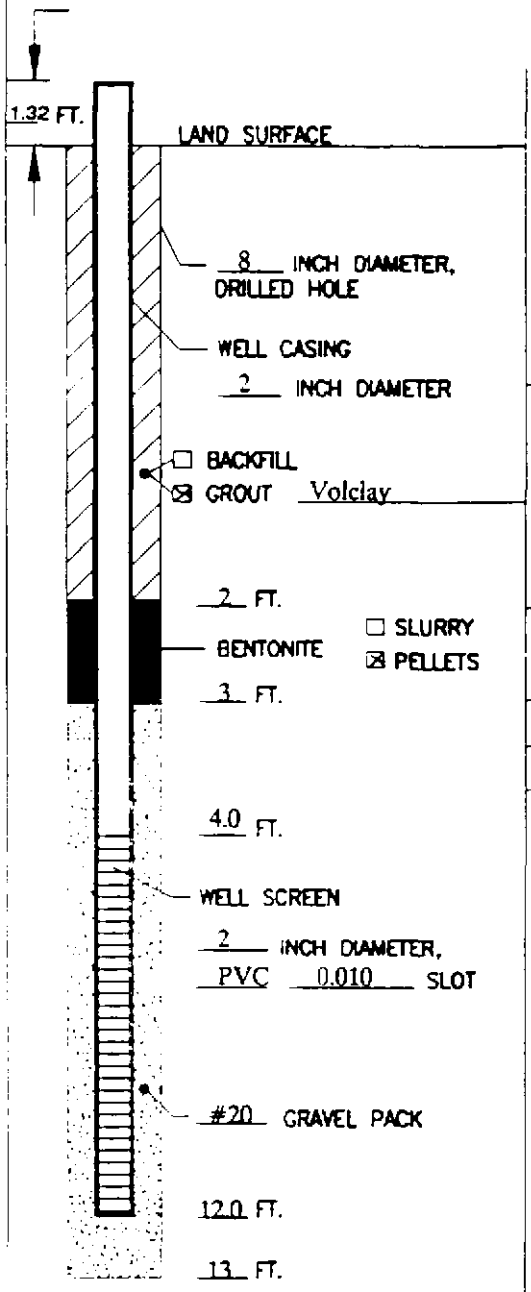
WELL PURPOSE Monitor ground-water in bedrock.

REMARKS Well recovers at very slow rate, e.g. water elevations measured after well installation were: -4.13' (11/27/91); 43.85' (01/13/92) and 58.89' (02/20/92). Measuring point (M.P.) is top of steel casing. M.P. elevation is 70.33 feet above mean sea level.
Well was abandoned on 02/20/92 by grounding up borehole and cutting casing below grade.
Fracture Zone (determined from change in drilling conditions): 48 - 49'; 52 - 52.5'; 57 - 58'.

HYDROGEOLOGIST M. Smith

ROUX
ROUX ASSOCIATES INC
Environmental Consulting & Management

MONITORING WELL CONSTRUCTION LOG



NOTE:
ALL DEPTHS IN FEET
BELOW LAND SURFACE

PROJECT NAME ISRT GSIP Phase 2 NUMBER 06624Y

WELL NO. OW-54A PERMIT NO. N.A.

TOWN/CITY Woburn

COUNTY Middlesex STATE Massachusetts

LAND SURFACE ELEVATION

AND DATUM 62.7 FEET

above mean sea level.

☒ SURVEYED

☐ ESTIMATED

INSTALLATION DATE(S) 09/18/91

DRILLING METHOD Hollow Stem Auger

DRILLING CONTRACTOR D.L. Maher

DRILLING FLUID Potable water

DEVELOPMENT TECHNIQUE(S) AND DATE(S)

Surged and pumped on 09/20/91.

FLUID LOSS DURING DRILLING NM GALLONS

WATER REMOVED DURING DEVELOPMENT 80 GALLONS

STATIC DEPTH TO WATER 8.14 (01/13/92) FEET BELOW M.P.

PUMPING DEPTH TO WATER NA FEET BELOW M.P.

PUMPING DURATION NA HOURS

YIELD NA GPM NA DATE NA

SPECIFIC CAPACITY NA GPM/FT.

WELL PURPOSE Monitor shallow unconsolidated ground-water conditions.

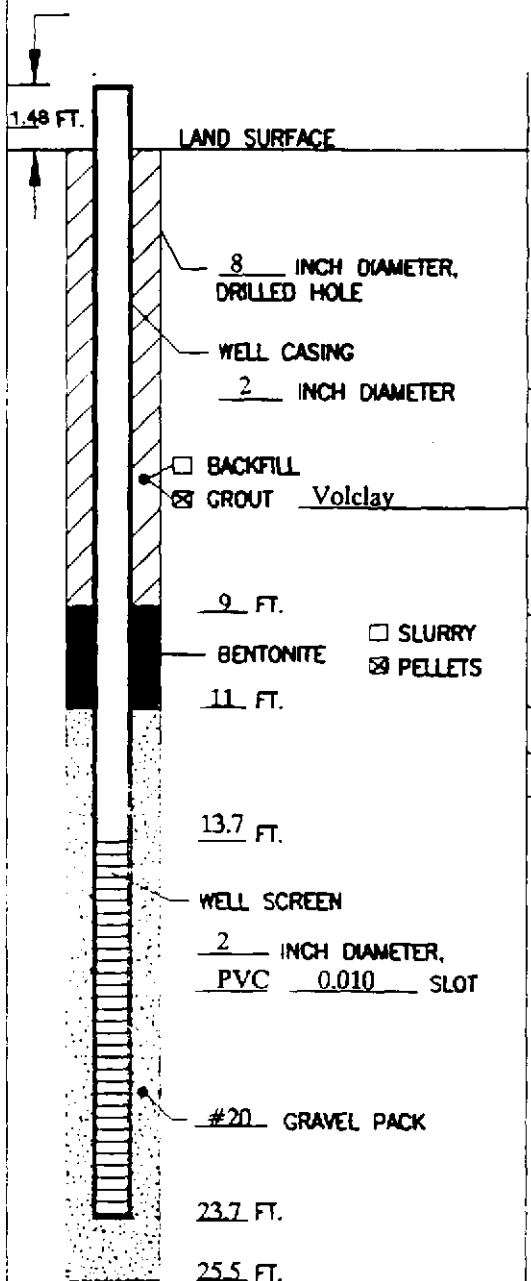
REMARKS Well installed as part of cluster with OW-54B, OW54C, and OW-55.

Measuring point (M.P.) is top of PVC casing. M.P. elevation is 64.02 feet above mean sea level.

HYDROGEOLOGIST D. Aschman

ROUX ASSOCIATES INC
Environmental Consulting & Management

MONITORING WELL CONSTRUCTION LOG



NOTE:
ALL DEPTHS IN FEET
BELOW LAND SURFACE

PROJECT NAME ISRT GSIP Phase 2 NUMBER 06624Y

WELL NO. OW-54B PERMIT NO. N.A.

TOWN/CITY Woburn

COUNTY Middlesex STATE Massachusetts

LAND SURFACE ELEVATION AND DATUM 62.8 FEET above mean sea level.

☒ SURVEYED
☐ ESTIMATED

INSTALLATION DATE(S) 09/18/91

DRILLING METHOD Hollow Stem Auger

DRILLING CONTRACTOR D.L. Maher

DRILLING FLUID Potable water.

DEVELOPMENT TECHNIQUE(S) AND DATE(S)
Surged and pumped on 09/20/91. Water is pale yellow but sediment free at end.

FLUID LOSS DURING DRILLING 25 GALLONS

WATER REMOVED DURING DEVELOPMENT 135 GALLONS

STATIC DEPTH TO WATER 8.34 (01/13/92) FEET BELOW M.P.

PUMPING DEPTH TO WATER NA FEET BELOW M.P.

PUMPING DURATION NA HOURS

YIELD NA GPM NA DATE NA

SPECIFIC CAPACITY NA GPM/FT.

WELL PURPOSE Monitor intermediate unconsolidated ground-water conditions.

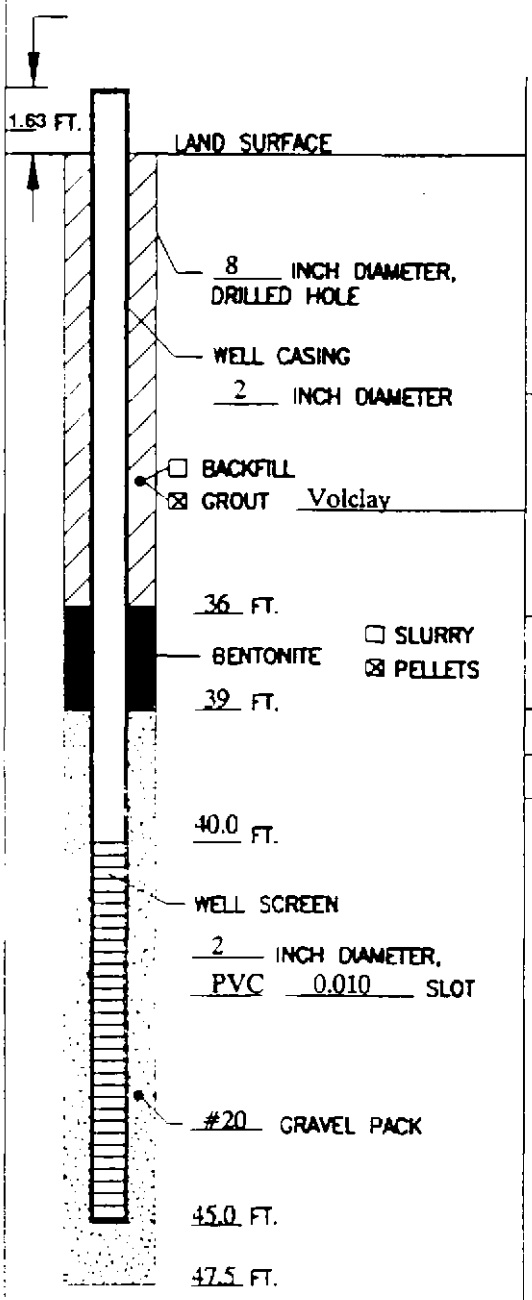
REMARKS Well installed as part of cluster with OW-54A, OW-54C, and OW-55.

Measuring point (M.P.) is top of PVC casing. M.P. elevation is 64.28 feet above mean sea level.

HYDROGEOLOGIST D. Aschman

ROUX
ROUX ASSOCIATES INC
Environmental Consulting & Management

MONITORING WELL CONSTRUCTION LOG



NOTE:
ALL DEPTHS IN FEET
BELOW LAND SURFACE

PROJECT NAME ISRT GSIP Phase 2 NUMBER 08624Y

WELL NO. OW-54C PERMIT NO. N.A.

TOWN/CITY Woburn

COUNTY Middlesex STATE Massachusetts

LAND SURFACE ELEVATION

AND DATUM 62.7 FEET above mean sea level.

☒ SURVEYED
☐ ESTIMATED

INSTALLATION DATE(S) 09/17/91

DRILLING METHOD Hollow Stem Auger

DRILLING CONTRACTOR D.L. Maher

DRILLING FLUID Potable water

DEVELOPMENT TECHNIQUE(S) AND DATE(S)

Surged and pumped on 09/20/91. Water clears to golden brown.

FLUID LOSS DURING DRILLING 875 GALLONS

WATER REMOVED DURING DEVELOPMENT 85 GALLONS

STATIC DEPTH TO WATER 8.24 (01/13/92) FEET BELOW M.P.

PUMPING DEPTH TO WATER NA FEET BELOW M.P.

PUMPING DURATION NA HOURS

YIELD NA GPM NA DATE NA

SPECIFIC CAPACITY NA GPM/FT.

WELL PURPOSE Monitor basal unconsolidated ground-water conditions.

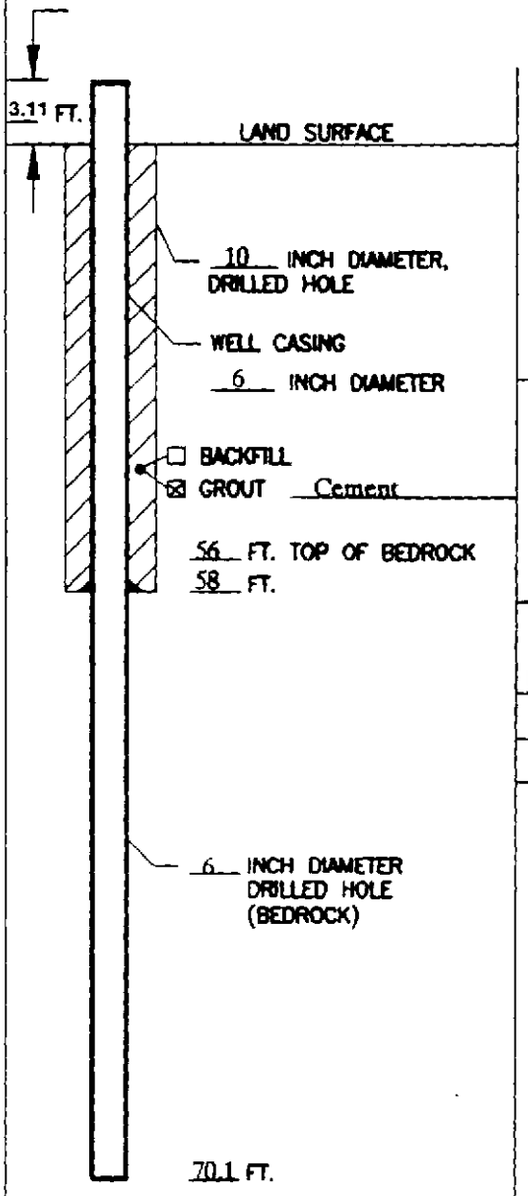
REMARKS Well installed as part of cluster with OW-54A, OW-54B, and OW-55.

Measuring point (M.P.) is top of PVC casing. M.P. elevation is 64.33 feet above mean sea level.

HYDROGEOLOGIST D. Aschman

ROUX ASSOCIATES INC
Environmental Consulting & Management

BEDROCK MONITORING WELL CONSTRUCTION LOG



NOTE:
ALL DEPTHS IN FEET
BELOW LAND SURFACE

PROJECT NAME ISRT GSIP Phase 2 NUMBER 06824Y

WELL NO. OW-55 PERMIT NO. N.A.

TOWN/CITY Woburn

COUNTY Middlesex STATE Massachusetts

LAND SURFACE ELEVATION AND DATUM 62.7 FEET above mean sea level.

☒ SURVEYED ☐ ESTIMATED

INSTALLATION DATE(S) 12/04/91

DRILLING METHOD Barber Rig (air hammer/spin casing)

DRILLING CONTRACTOR D.L. Maher

DRILLING FLUID Potable water

DEVELOPMENT TECHNIQUE(S) AND DATE(S)
Pumped 75 gallons (12/13/91). Poor producer.

FLUID LOSS DURING DRILLING NM GALLONS

WATER REMOVED DURING DEVELOPMENT 95 GALLONS

STATIC DEPTH TO WATER 9.99 (03/19/92) FEET BELOW M.P.

PUMPING DEPTH TO WATER NA FEET BELOW M.P.

PUMPING DURATION NA HOURS

YIELD NA GPM NA DATE NA

SPECIFIC CAPACITY NA GPM/FT.

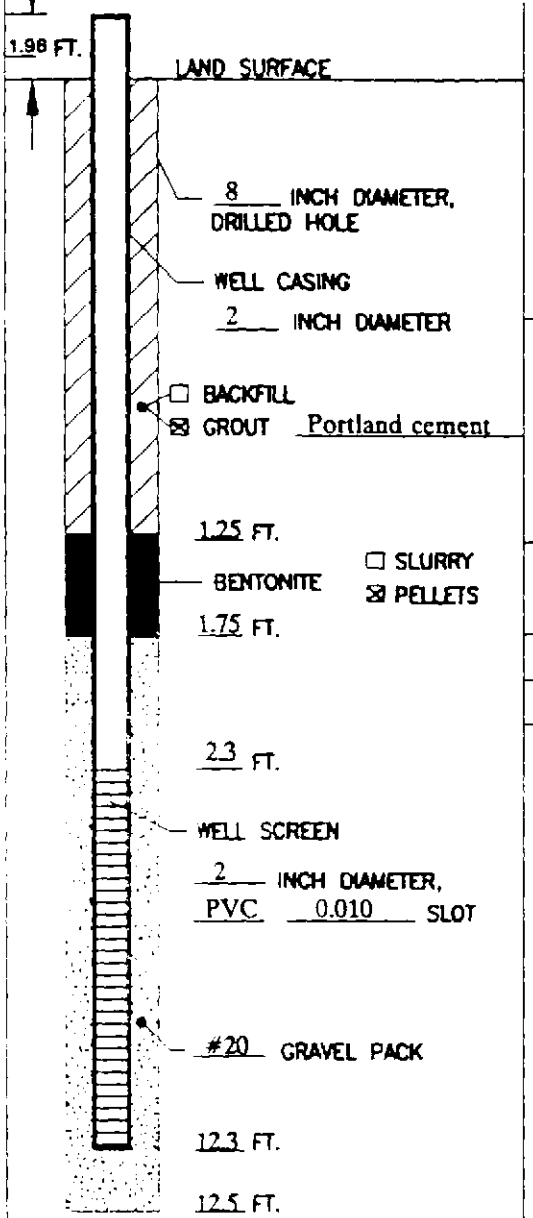
WELL PURPOSE Monitor ground-water in shallow bedrock.

REMARKS Measuring point (M.P.) is top of steel casing. M.P. elevation is 65.81
No fracture zones.

HYDROGEOLOGIST M. Smith

ROUX
ROUX ASSOCIATES INC
Environmental Consulting & Management

MONITORING WELL CONSTRUCTION LOG



NOTE:
ALL DEPTHS IN FEET
BELOW LAND SURFACE

PROJECT NAME ISRT GSIP Phase 2 NUMBER 06624Y

WELL NO. OW-56A PERMIT NO. N.A.

TOWN/CITY Woburn

COUNTY Middlesex STATE Massachusetts

LAND SURFACE ELEVATION AND DATUM 57.4 FEET above mean sea level.

☒ SURVEYED
☐ ESTIMATED

INSTALLATION DATE(S) 10/23/91

DRILLING METHOD Hollow Stem Auger

DRILLING CONTRACTOR D.L. Maher

DRILLING FLUID Potable water

DEVELOPMENT TECHNIQUE(S) AND DATE(S)
Surged and pumped on 12/11/91.

FLUID LOSS DURING DRILLING 25 GALLONS

WATER REMOVED DURING DEVELOPMENT 390 GALLONS

STATIC DEPTH TO WATER 7.48 (01/13/92) FEET BELOW M.P

PUMPING DEPTH TO WATER NA FEET BELOW M.P

PUMPING DURATION NA HOURS

YIELD NA GPM NA DATE NA

SPECIFIC CAPACITY NA GPM/FT.

WELL PURPOSE Monitor shallow unconsolidated ground-water conditions.

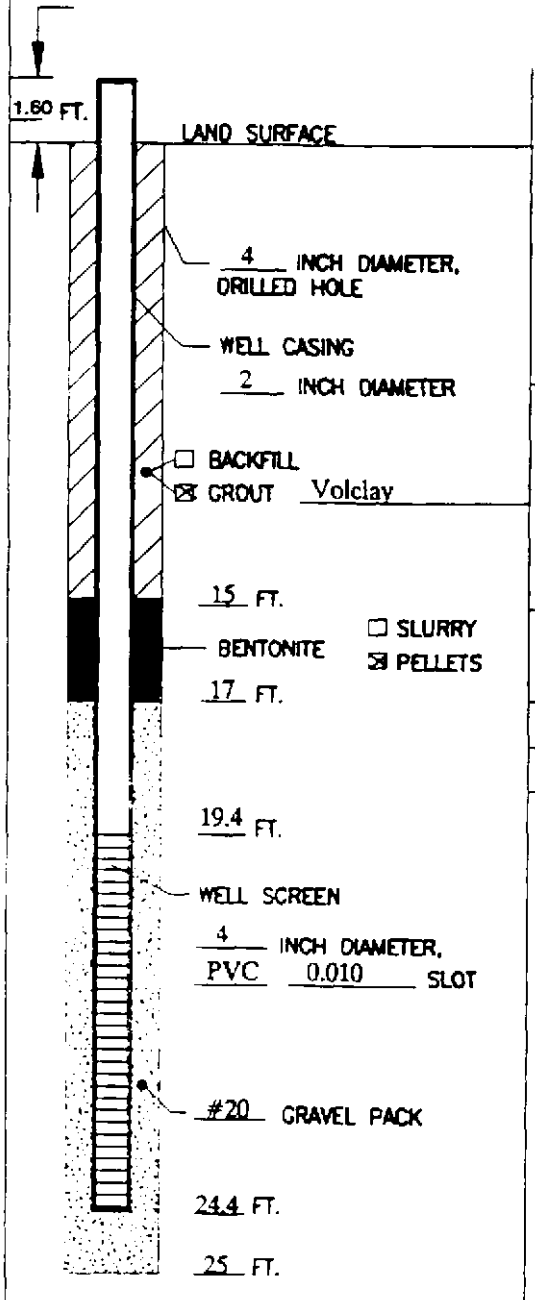
REMARKS Well installed as part of cluster with OW-56B, OW-56C and OW-57.

Measuring point (M.P.) is top of PVC casing. M.P. elevation is 59.36 feet above mean sea level.

HYDROGEOLOGIST D. Aschman

ROUX
ROUX ASSOCIATES INC
Environmental Consulting & Management

MONITORING WELL CONSTRUCTION LOG



NOTE:
ALL DEPTHS IN FEET
BELOW LAND SURFACE

PROJECT NAME ISRT GSIP Phase 2 NUMBER 06624Y

WELL NO. OW-56B PERMIT NO. N.A.

TOWN/CITY Woburn

COUNTY Middlesex STATE Massachusetts

LAND SURFACE ELEVATION
AND DATUM 57.4 FEET
above mean sea level.

☒ SURVEYED
☐ ESTIMATED

INSTALLATION DATE(S) 10/23/91

DRILLING METHOD Hollow Stem Auger

DRILLING CONTRACTOR D.L. Maher

DRILLING FLUID Potable water

DEVELOPMENT TECHNIQUE(S) AND DATE(S)
Surged and pumped on 12/11/91.

FLUID LOSS DURING DRILLING 15 GALLONS

WATER REMOVED DURING DEVELOPMENT 80 GALLONS

STATIC DEPTH TO WATER 7.09 (01/13/92) FEET BELOW M.P.

PUMPING DEPTH TO WATER NA FEET BELOW M.P.

PUMPING DURATION NA HOURS

YIELD NA GPM NA DATE NA

SPECIFIC CAPACITY NA GPM/FT.

WELL PURPOSE Monitor intermediate unconsolidated ground-water conditions.

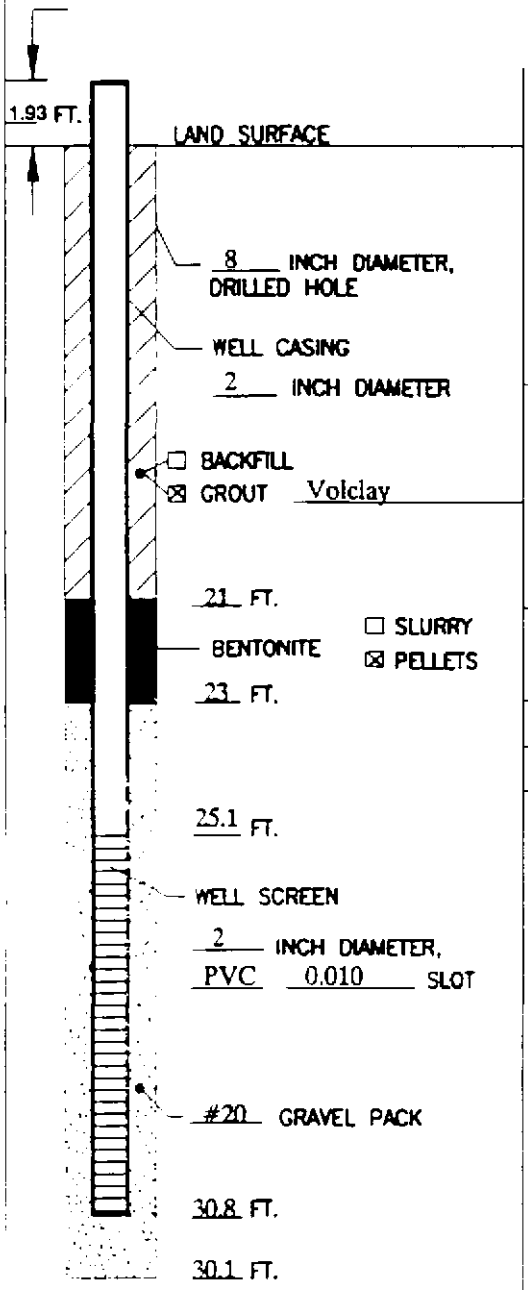
REMARKS Well installed as part of cluster with OW-56A, OW-56C and OW-57.

Measuring point (M.P.) is top of PVC casing. M.P. elevation is 59.00 feet above mean sea level.

HYDROGEOLOGIST D. Aschman

ROUX
ROUX ASSOCIATES INC
Environmental Consulting & Management

MONITORING WELL CONSTRUCTION LOG



NOTE:
ALL DEPTHS IN FEET
BELOW LAND SURFACE

PROJECT NAME ISRT GSIP Phase 2 NUMBER 06624Y

WELL NO. OW-56C PERMIT NO. N.A.

TOWN/CITY Woburn

COUNTY Middlesex STATE Massachusetts

LAND SURFACE ELEVATION AND DATUM 57.4 FEET above mean sea level.

☒ SURVEYED ☐ ESTIMATED

INSTALLATION DATE(S) 09/21/91 - 09/23/91

DRILLING METHOD Hollow Stem Auger

DRILLING CONTRACTOR D.L. Maher

DRILLING FLUID Potable water

DEVELOPMENT TECHNIQUE(S) AND DATE(S)
Surged and pumped on 12/11/91.

FLUID LOSS DURING DRILLING 120 GALLONS

WATER REMOVED DURING DEVELOPMENT 130 GALLONS

STATIC DEPTH TO WATER 7.45 (01/13/92) FEET BELOW M.P.

PUMPING DEPTH TO WATER NA FEET BELOW M.P.

PUMPING DURATION NA HOURS

YIELD NA GPM NA DATE NA

SPECIFIC CAPACITY NA GPM/FT.

WELL PURPOSE Monitor basal unconsolidated ground-water conditions.

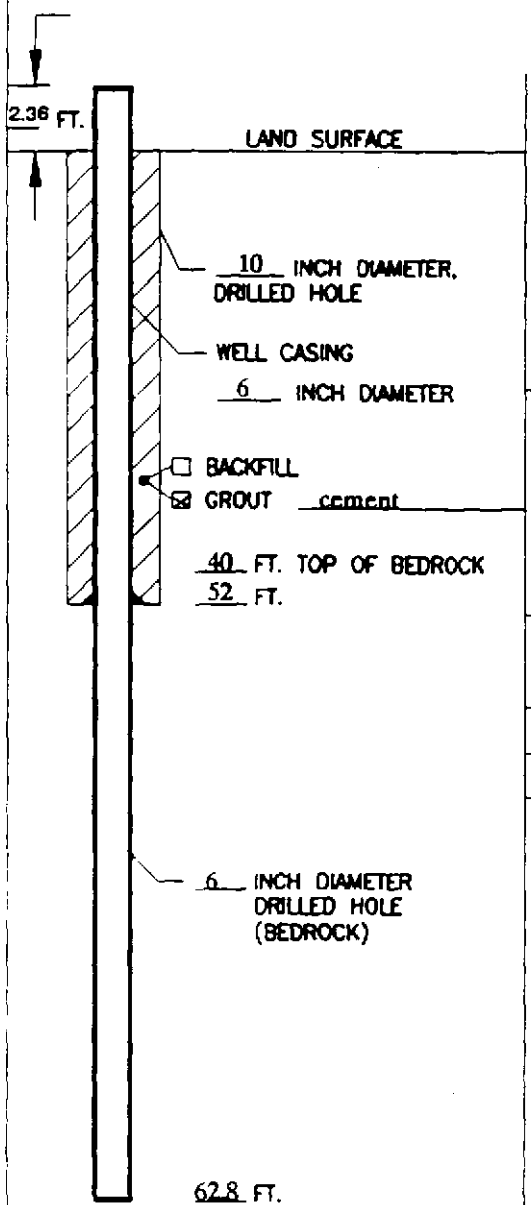
REMARKS Well installed as part of cluster with OW-56A, OW-56B and OW-57.

Measuring point (M.P.) is top of PVC casing M.P. elevation is 59.33 feet above mean sea level.

HYDROGEOLOGIST D. Aschman

ROUX ASSOCIATES INC
Environmental Consulting & Management

BEDROCK MONITORING WELL CONSTRUCTION LOG



NOTE:
ALL DEPTHS IN FEET
BELOW LAND SURFACE

PROJECT NAME ISRT GSIP Phase 2 NUMBER 06824Y

WELL NO. OW-57 PERMIT NO. N.A.

TOWN/CITY Woburn

COUNTY Middlesex STATE Massachusetts

LAND SURFACE ELEVATION AND DATUM 57.0 FEET above mean sea level.

☒ SURVEYED
☐ ESTIMATED

INSTALLATION DATE(S) 12/09/91 - 12/10/91

DRILLING METHOD Barber Rig (air hammer/spin casing)

DRILLING CONTRACTOR D.L. Maher

DRILLING FLUID Potable water.

DEVELOPMENT TECHNIQUE(S) AND DATE(S)
Poor producer, not enough water to develop.

FLUID LOSS DURING DRILLING NM GALLONS

WATER REMOVED DURING DEVELOPMENT NA GALLONS

STATIC DEPTH TO WATER See remarks FEET BELOW M.P.

PUMPING DEPTH TO WATER NA FEET BELOW M.P.

PUMPING DURATION NA HOURS

YIELD NA GPM NA DATE NA

SPECIFIC CAPACITY NA GPM/FT.

WELL PURPOSE Monitor ground-water in shallow bedrock.

REMARKS Well recovers at very slow rate, e.g. water elevation measurered after well installation were: -3.91' (12/12/91); 14.58 (01/13/92); 26.00' (02/17/92) and 52.17' (03/20/92).

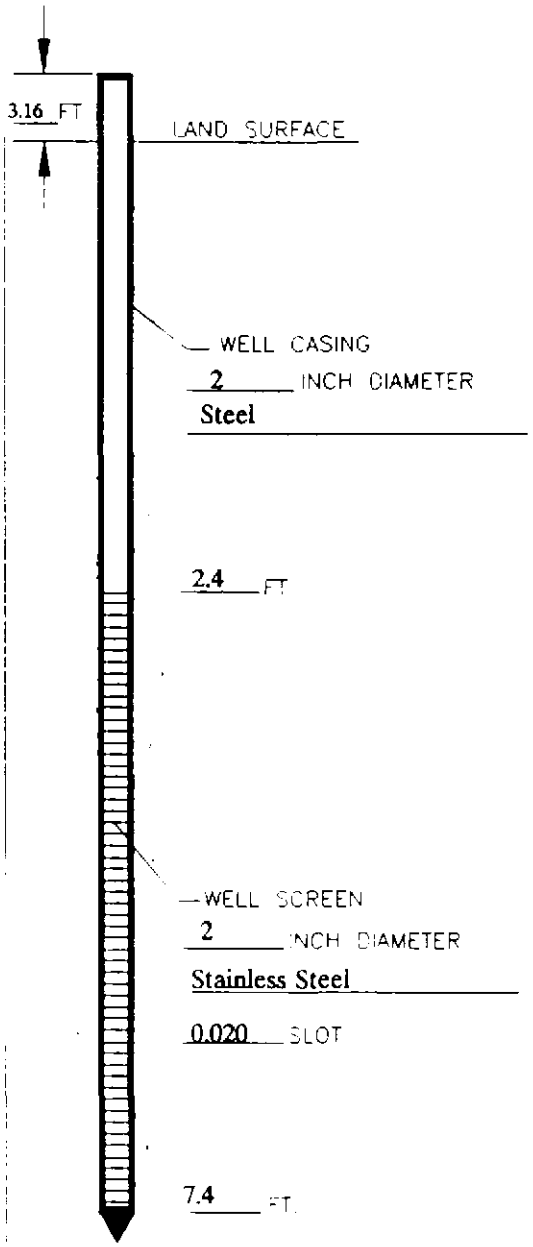
Measuring point (M.P.) is top of steel casing. M.P. elevation is 59.36 feet above mean sea level.

HYDROGEOLOGIST M. Smith

ROUX
ROUX ASSOCIATES INC
Environmental Consulting & Management

WELL POINT

CONSTRUCTION LOG



PROJECT NAME ISRT GSIP Phase 2 NUMBER 06824Y

WELL NO. WP-1 PERMIT NO. N.A.

TOWN/CITY Woburn

COUNTY Middlesex STATE Massachusetts

LAND-SURFACE ELEVATION

AND DATUM 83.4 FEET ☒ SURVEYED

above mean sea level. ☐ ESTIMATED

INSTALLATION DATES(S) 10/22/91 - 10/24/91

DRILLING METHOD Hollow Stem Auger

DRILLING CONTRACTOR D.L. Maher

DEVELOPMENT TECHNIQUE(S) AND DATE(S)

Well point surged and pumped on 12/12/91. Well slow to recover.

WATER REMOVED DURING DEVELOPMENT 9 GALLONS

STATIC DEPTH TO WATER 9.63 (01/14/92) FEET BELOW M.P.

WELL PURPOSE Monitor ground-water conditions near West Hide Pile.

REMARKS Well point placed in 8 inch diameter auger hole and backfilled. No gravel pack or seal.

All depths in feet from land surface unless stated otherwise.

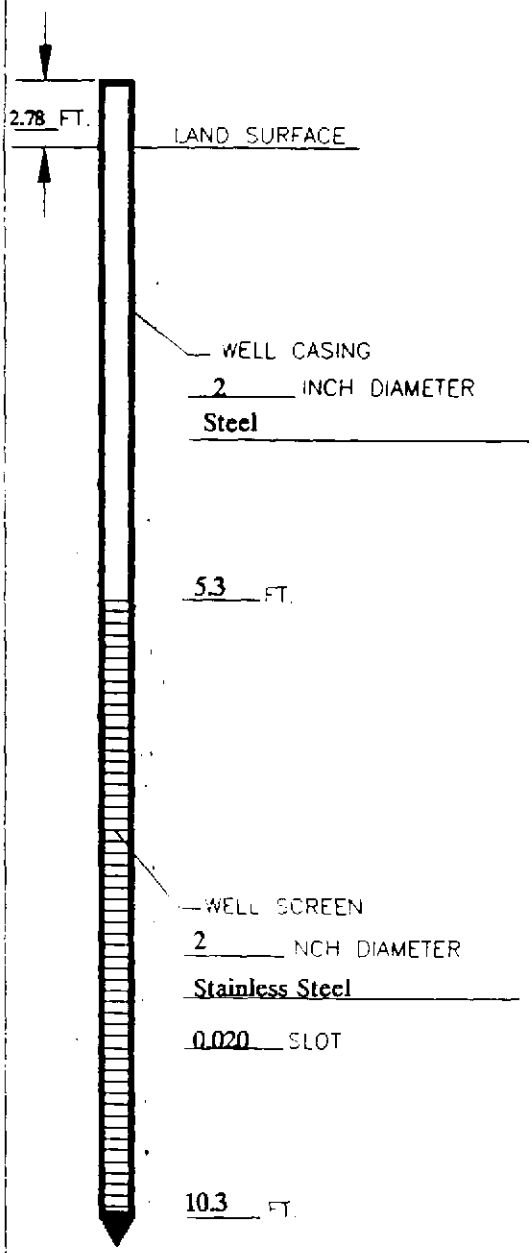
Measuring point (M.P.) is top of steel riser. M.P. elevation is 86.56 feet above mean sea level.

HYDROGEOLOGIST D. Aschman

ROUX
ROUX ASSOCIATES INC
Environmental Consulting & Management

WELL POINT

CONSTRUCTION LOG



PROJECT NAME ISRT GSIP Phase 2 NUMBER 06624Y

WELL NO. WP-2 PERMIT NO. N.A.

TOWN/CITY Woburn

COUNTY Middlesex STATE Massachusetts

LAND-SURFACE ELEVATION

AND DATUM 85.0 FEET ☒ SURVEYED

above mean sea level. ☐ ESTIMATED

INSTALLATION DATES(S) 10/24/91 - 10/25/91

DRILLING METHOD Hand driven

DRILLING CONTRACTOR D.L. Maher

DEVELOPMENT TECHNIQUE(S) AND DATE(S)

Dry. No water in well point (12/13/91).

WATER REMOVED DURING DEVELOPMENT 0 GALLONS

STATIC DEPTH TO WATER N.A. FEET BELOW M.P.

WELL PURPOSE Monitor ground-water conditions near West Hide Pile.

REMARKS Bentonite chips sealing coupling at top of screen, approx. 3-4" deep. Chips are above screen opening.

All depths in feet from land surface unless stated otherwise.

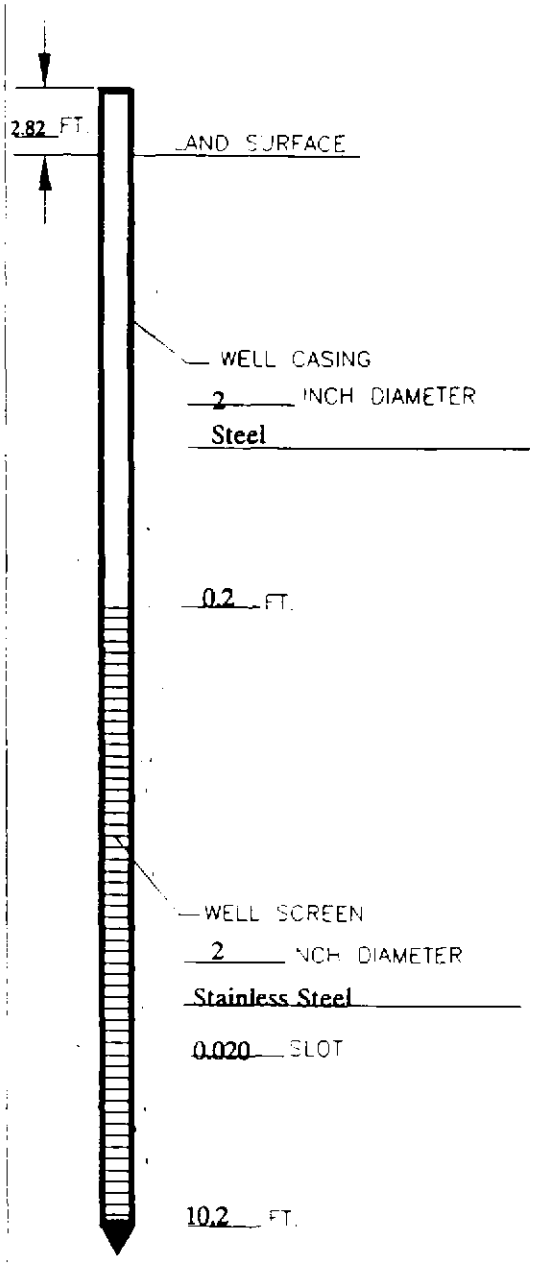
Measuring point (M.P.) is top of steel riser. M.P. elevation is 87.78 feet above mean sea level.

HYDROGEOLOGIST D. Aschman

ROUX
ROUX ASSOCIATES INC
Environmental Consulting & Management

WELL POINT

CONSTRUCTION LOG



PROJECT NAME ISRT GSIP Phase 2 NUMBER 06624Y

WELL NO WP-3 PERMIT NO. N.A.

TOWN/CITY Woburn

COUNTY Middlesex STATE Massachusetts

LAND-SURFACE ELEVATION

AND DATUM 72.6 FEET ☒ SURVEYED

above mean sea level. ☐ ESTIMATED

INSTALLATION DATES(S) 09/24/91, 10/22/91

DRILLING METHOD Hand Driven

DRILLING CONTRACTOR D.L. Maher

DEVELOPMENT TECHNIQUE(S) AND DATE(S)

Well point bailed on 12/13/19.

WATER REMOVED DURING DEVELOPMENT 24 GALLONS

STATIC DEPTH TO WATER 5.30 (01/14/92) FEET BELOW M.P.

WELL PURPOSE Monitor ground-water conditions near West Hide Pile.

REMARKS Installed screen 09/24/91, riser added on 10/22/91.

All depths in feet from land surface unless stated otherwise.

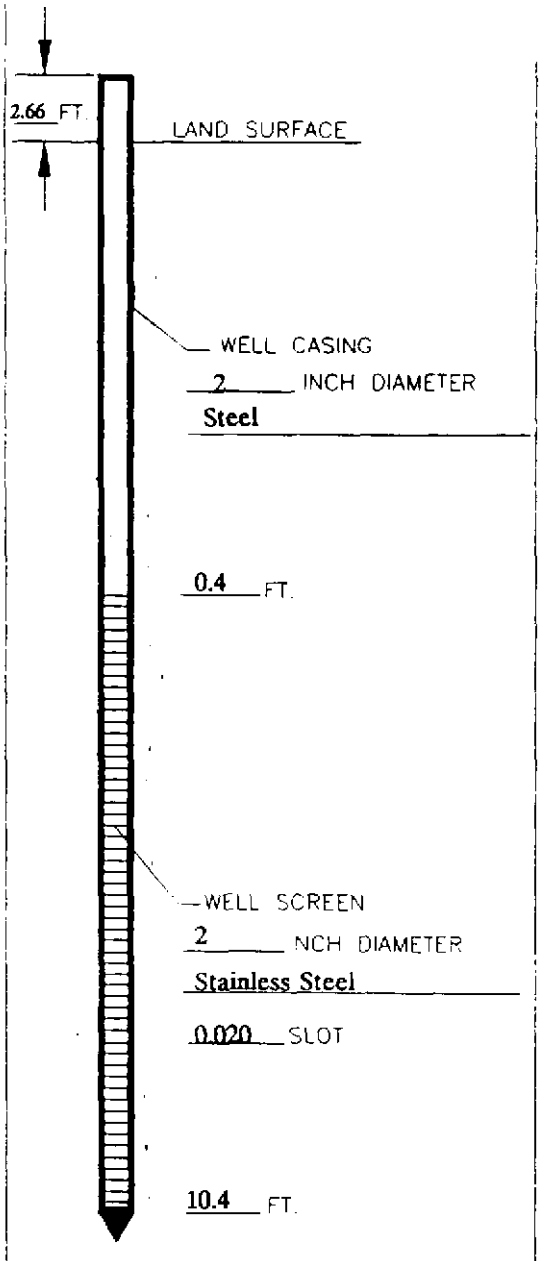
Measuring point (M.P.) is top of steel riser. M.P. is 75.42 feet above mean sea level.

HYDROGEOLOGIST D. Aschman

ROUX ASSOCIATES INC
Environmental Consulting & Management

WELL POINT

CONSTRUCTION LOG



PROJECT NAME ISRT GSIP Phase 2 NUMBER 06624Y

WELL NO. WP-4 PERMIT NO. N.A.

TOWN/CITY Woburn

COUNTY Middlesex STATE Massachusetts

LAND-SURFACE ELEVATION

AND DATUM 74.1 FEET ☒ SURVEYED

above mean sea level. ☐ ESTIMATED

INSTALLATION DATES(S) 10/22/91

DRILLING METHOD Hand driven

DRILLING CONTRACTOR D.L. Maher

DEVELOPMENT TECHNIQUE(S) AND DATE(S)

Well point bailed on 12/12/91.

WATER REMOVED DURING DEVELOPMENT 35 GALLONS

STATIC DEPTH TO WATER 6.83 (01/14/92) FEET BELOW M.P.

WELL PURPOSE Monitor ground-water conditions near West Hide Pile.

REMARKS All depths in feet from land surface unless stated otherwise.

Measuring point (M.P.) is top of steel riser. M.P. elevation is 76.76 feet above mean sea level.

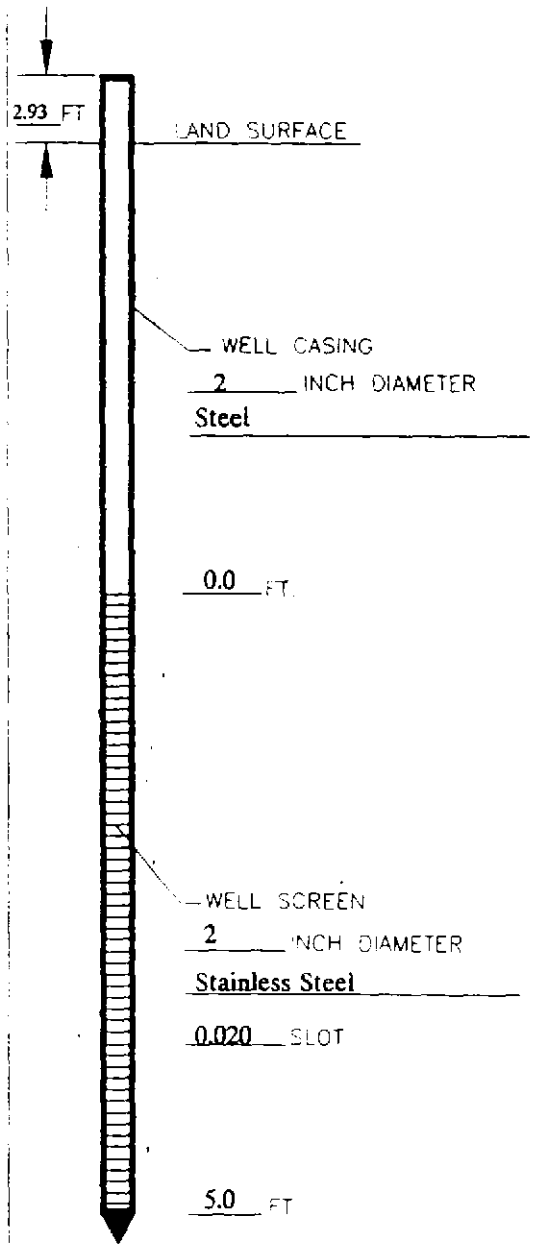
HYDROGEOLOGIST D. Aschman

ROUX

ROUX ASSOCIATES INC
Environmental Consulting & Management

WELL POINT

CONSTRUCTION LOG



PROJECT NAME ISRT GSIP Phase 2 NUMBER 06824Y

WELL NO. WP-5 PERMIT NO. N.A.

TOWN/CITY Woburn

COUNTY Middlesex STATE Massachusetts

LAND-SURFACE ELEVATION

AND DATUM 70.8 FEET ☒ SURVEYED

above mean sea level ☐ ESTIMATED

INSTALLATION DATES(S) 10/25/91

DRILLING METHOD Hand driven

DRILLING CONTRACTOR D.L. Maher

DEVELOPMENT TECHNIQUE(S) AND DATE(S)

Well point bailed on 12/12/91.

WATER REMOVED DURING DEVELOPMENT 40 GALLONS

STATIC DEPTH TO WATER 3.77 (01/14/92) FEET BELOW M.P.

WELL PURPOSE Monitor ground-water conditions near West Hide Pile.

REMARKS Only 5' of screen could be driven due to refusal at 5.5'.

All depths in feet from land surface unless stated otherwise.

Measuring point (M.P.) is top of steel riser. M.P. elevation is 73.73 feet above mean sea level.

HYDROGEOLOGIST D. Aschman

APPENDIX B3

Well Survey Coordinate Information

SAIC Engineering, Inc.
A Subsidiary of Science Applications International Corporation
An Employee-Owned Company

February 4, 1992

LV-3151
01-0801-05-0878-001

Roux Associates
775 Park Avenue
Suite 25
Huntington, New York 11743

Attention: Ms. Martha Smith

Reference: February 1992 Survey locations at ISRT, Woburn, Ma.

Dear Martha:

Below are the coordinate values and elevations of the locations requested.

Reference	Northing	Easting	Ground	Casing	PVC
OW-37A	553885.7	695869.1	69.7	71.88	71.58
OW-52A	552716.7	696249.0	67.3	69.34	69.22
OW-52B	552706.9	696235.4	67.6	69.18	69.05
OW-51B	553885.2	695861.8	69.5	72.60	-----
OW-53B	552701.3	696246.1	67.4	70.33	-----
OW-54A	552220.4	696565.9	62.7	64.70	64.02
OW-54B	552226.4	696578.3	62.8	64.46	64.28
OW-54C	552226.0	696590.2	62.7	64.56	64.33
OW-55	552227.9	696555.2	62.7	65.81	-----
OW-56A	551636.8	696680.5	57.4	59.63	59.36
OW-56B	551632.5	696683.8	57.4	59.45	59.00
OW-56C	551626.7	696687.3	57.4	59.59	59.33
OW-57	551645.6	696696.9	57.0	59.36	-----
WP-1	554427.9	695466.0	83.4	86.56	-----
WP-2	554767.3	695560.2	85.0	87.78	-----
WP-3	554745.4	695742.6	72.6	75.42	-----
WP-4	554530.3	695826.4	74.1	76.76	-----
WP-5	554340.3	695755.6	70.8	73.73	-----

The Staff Gauge previously located near well cluster OW-56 was found to have been removed from its original location. Apparently it had been removed and floated south on the pond approximately 300 feet where it subsequently became frozen in the ice. Our field crew was able to break through the ice, retrieve the staff gauge, and reset it in the location that you described.

Upon driving it into the pond bed the wood to which the staff gauge was attached became split and splayed at its top, probably because the wood was so wet and frozen.The gauge is set about 8 feet off the edge of shore and was set as solidly as we could under the circumstances. The new coordinates and elevation follow:

REFERENCE	NORTHING	EASTING	ELEVATION AT 3.33 MARK
STAFF GAUGE	551637.9	696642.7	54.16

Water level of pond read 0.80 on the gauge, elevation 51.63.

Also note that the aluminum casing cover casting on well OW-54B was cracked and loose, the survey crew made the elevation observation on the top of the steel casing.

If you have any questions or if we can be of any help, do not hesitate to call.

Sincerely,

SAIC ENGINEERING, INC.

Michael R. Keegan

Michael R. Keegan, P.L.S.

MEMORANDUM

TO: File, Project 06624Y
FROM: M. Smith, Roux Associates, Inc. M Smith
DATE: May 27, 1992
RE: Notes on Staff Gauge at SW-56

Staff gauge SW-56 at the Industri-Plex Site, Woburn, Massachusetts, was installed several times during the GSIP Phase 2 RI, and only the March 20, 1992 measurement can be related to other measurements collected at the Site.

SW-56 was first installed in Hall's Brook Holding Area (HBHA) adjacent to observation wells OW-56A, OW-56B and OW-56C on October 4, 1991 by Doris Aschman and Martha Smith of Roux Associates, Inc. However, during January 1992, ice on HBHA pulled the staff gauge out. The staff gauge was reinstalled and surveyed by SAIC at the beginning of February 1992. Once again, during the February round of water-levels (February 18-21, 1992), the staff gauge was found pulled out.

During the March 1992 water level round, the staff gauge was reinstalled and resurveyed by Herb Ernst of Roux Associates, Inc. and Dale Kling of the ISRT. Due to the repeated reinstallation of SW-56 staff gauge, only the March 20, 1992 measurement can be related to other ground-water and surface-water measurements at the Site.

The measurements collected on March 20, 1992 are:

- SW-56 staff gauge measuring point elevation at the 3.30 mark on the staff gauge is 54.47 feet above mean sea level; and the
- HBHA water level measured at SW-56 is 51.62 feet above mean sea level.

APPENDIX B4

Ground-Water Sampling Forms and
Chain of Custody Forms

APPENDIX B4

Ground-Water Sampling Forms

ROUX Consulting Ground-Water Geologists
ROUX ASSOCIATES, INC.

WELL SAMPLING DATA FORM

CLIENT Industri-Plex Site Remedial Trust.
PROJECT NO. 06624X
LOCATION Woburn, MA

WELL NUMBER OW-30A
DATE 12/16/91
WEATHER cloudy, windy and Snow
SAMPLED BY M. Smith, A Farrell

TYPE OF WELL 4 inch PVC
STORAGE TANK N/A
TIME OF START 1130 AM
TIME OF FINISH 1210 PM.

DEPTH TO BOTTOM OF WELL	20.72	FT.
DEPTH TO WATER	12.15	FT.
WATER COLUMN	8.57	FT.
VOLUME OF WATER IN WELL	5.57	GAL.
VOLUME OF WATER TO REMOVE	16.71	GAL.
VOLUME REMOVED	17	GAL.

RATE OF PURGE 2 gal/min
METHOD OF PURGE hand bailed

PHYSICAL APPEARANCE/COMMENTS

Orange/Brown.

NUS (E.P.A.) collected split sample.

FIELD MEASUREMENTS

TIME	pH	COND	TEMP	TURB	Eh	O^2
1205 PM	6.75	560	10°C		112	5.65 mg/L

TYPES OF SAMPLES COLLECTED

3 TCL VOCs
1 TAL Metals (dissolved)

LABORATORY NAME AND LOCATION

Enseco 2200 Cottontail Lane Somerset, NJ 08875

ROUX Consulting Ground-Water Geologists - ROUX ASSOCIATES, INC.

WELL SAMPLING DATA FORM

CLIENT Industri-Plex Site Remedial Trust
PROJECT NO. 046244
LOCATION Woburn, MA

WELL NUMBER OW-308
DATE 12/16/91
WEATHER Dusk, Cold ~15°F
SAMPLED BY A. Farrell & C. Sawyer

TYPE OF WELL 4 inch PVC
STORAGE TANK N.A.
TIME OF START 1620
TIME OF FINISH 1650

DEPTH TO BOTTOM OF WELL	60.33	FT.
DEPTH TO WATER	11.97	FT.
WATER COLUMN	48.36	FT.
VOLUME OF WATER IN WELL	31.43	GAL.
VOLUME OF WATER TO REMOVE	94.29	GAL.
VOLUME REMOVED	100	GAL.

RATE OF PURGE 3 gal/min
METHOD OF PURGE Centrifugal pump

PHYSICAL APPEARANCE/COMMENTS
Clear and Colorless

NUS split samples collected.

FIELD MEASUREMENTS

TIME	pH	COND	TEMP	TURB	Eh	O^2
4:45 PM	7.46	540	6	Clear - colorless	22.8	7.53

TYPES OF SAMPLES COLLECTED

3 VOC TCL
1 TAL metals (dissolved)

LABORATORY NAME AND LOCATION
Enseco 2200 Cottontail lane Somerset, NJ 08875

ROUX Consulting Ground-Water Geologists - ROUX ASSOCIATES INC.

WELL SAMPLING DATA FORM

CLIENT Industriplex Site Remedial Trust
PROJECT NO. 066244
LOCATION Woburn - Mass

WELL NUMBER OW - 31
DATE 12/18/91
WEATHER Cold and Clear
SAMPLED BY A Farrell & C Wu

TYPE OF WELL 4" PVC
STORAGE TANK N.A.
TIME OF START 1210
TIME OF FINISH 1315

DEPTH TO BOTTOM OF WELL	17.05	FT.
DEPTH TO WATER	4.05	FT.
WATER COLUMN	13.00	FT.
VOLUME OF WATER IN WELL	9.5	GAL.
VOLUME OF WATER TO REMOVE	28.5	GAL.
VOLUME REMOVED	26	GAL.

RATE OF PURGE 2 gal/min
METHOD OF PURGE Hand Bailed

PHYSICAL APPEARANCE/COMMENTS

Clear dark brown - greenish color Split w/ EPA
@ bubbled w/ HCL, but did not dump out — waited for bubbles to subside

FIELD MEASUREMENTS

TIME	pH	COND	TEMP	TURB	Eh	O²
1240	6.82	6520	8°C		-29.64	4.72

TYPES OF SAMPLES COLLECTED

3 VOC (TCL)
1 TAL metals (dissolved)

LABORATORY NAME AND LOCATION

Ensco Somerset, NJ

ROUX Consulting Ground-Water Geologists — ROUX ASSOCIATES INC.

WELL SAMPLING DATA FORM

CLIENT Industrial Site Remedial Trust
PROJECT NO. 066244
LOCATION Woburn, Mass

WELL NUMBER OW-37
DATE 12/18/91
WEATHER Cold Clear
SAMPLED BY A Farrell C Wu

TYPE OF WELL 4" PVC Hortonville
STORAGE TANK N.A.
TIME OF START 1050
TIME OF FINISH 1130

DEPTH TO BOTTOM OF WELL	18.20	FT.
DEPTH TO WATER	5.05	FT.
WATER COLUMN	13.15	FT.
VOLUME OF WATER IN WELL	8.58	GAL.
VOLUME OF WATER TO REMOVE	25.75	GAL.
VOLUME REMOVED	30	GAL.

RATE OF PURGE 10 gal/min
METHOD OF PURGE Centrifugal Purge

PHYSICAL APPEARANCE/COMMENTS

Clear - Colorless
Purged dry, 3 times
Purged dry, 3 Times

(Split w/ EPA, who did a dup
Split w/ ~~EPA~~, They did a dup)

FIELD MEASUREMENTS

TIME	pH	COND	TEMP	TURB	Eh	O^2
1115	6.24	430	6°C	Clear Colorless	6.4	3.70

TYPES OF SAMPLES COLLECTED

3 VOC (TCL)
1 TAL metals (dissolved)

LABORATORY NAME AND LOCATION

Enesco Somerset, NJ

ROUX Consulting Ground-Water Geologists – ROUX ASSOCIATES INC.

WELL SAMPLING DATA FORM

CLIENT Industri-Plex Site Remedial Trust
PROJECT NO. 26/e244
LOCATION Wahurn, Mass

WELL NUMBER OW-37A
DATE 12/18/91
WEATHER Cold Clear
SAMPLED BY A. Farrell, C Hill

TYPE OF WELL 2" PVC Monitoring Well
STORAGE TANK NA
TIME OF START 1000
TIME OF FINISH 1040

DEPTH TO BOTTOM OF WELL	31.38	FT.
DEPTH TO WATER	5.85	FT.
WATER COLUMN	25.53	FT.
VOLUME OF WATER IN WELL	4.17	GAL.
VOLUME OF WATER TO REMOVE	≥ 12.50	GAL.
VOLUME REMOVED	15	GAL.

RATE OF PURGE 2 gal/min
METHOD OF PURGE Centrifugal pump

PHYSICAL APPEARANCE/COMMENTS

Rusty Brown Matrix Spike

FIELD MEASUREMENTS

TIME	pH	COND	TEMP	TURB	Eh	O^2
1030	6.43	440	9°	Rusty Clear	81.8	3.31

TYPES OF SAMPLES COLLECTED

3 VOC (TCL)
1 TAL metals (dissolved)
Matrix Spike and Matrix Spike Duplicate
Matrix Spike for both, and a Matrix spike duplicate

LABORATORY NAME AND LOCATION

Enesco Somerset, NJ

ROUX Consulting Ground-Water Geologists - ROUX ASSOCIATES INC.

WELL SAMPLING DATA FORM

CLIENT Industri-Plex Site Remedial Trust
PROJECT NO. 06624Y
LOCATION Wakefield, MA

WELL NUMBER OW 52A
DATE 12-17-91
WEATHER Cold clear
SAMPLED BY A. Farrell C. Hall

TYPE OF WELL 2" PVC
STORAGE TANK NA.
TIME OF START 1030
TIME OF FINISH 1055

DEPTH TO BOTTOM OF WELL	12.4	FT.
DEPTH TO WATER	9.74	FT.
WATER COLUMN	2.64	FT.
VOLUME OF WATER IN WELL	0.42	GAL.
VOLUME OF WATER TO REMOVE	1.27	GAL.
VOLUME REMOVED	1.3	GAL.

RATE OF PURGE 1 gal/min
METHOD OF PURGE hand bailed

PHYSICAL APPEARANCE/COMMENTS

Split WJ EPA

FIELD MEASUREMENTS

TIME	pH	COND	TEMP	TURB	Eh	O^2
1050	6.02	1990	9°C	Clear	61.6	2.69

TYPES OF SAMPLES COLLECTED

3 VOC (TCL)
1 TAL metals (dissolved)

LABORATORY NAME AND LOCATION

Enesco Somerset, NJ

ROUX Consulting Ground-Water Geologists · ROUX ASSOCIATES INC.

WELL SAMPLING DATA FORM

CLIENT Industri-Plex Site Remedial Trust
PROJECT NO. 06624X
LOCATION Wilburn, MA

WELL NUMBER OW52B
DATE 12/12/91
WEATHER Cold and Clear
SAMPLED BY A. Farrell & C. Wu

TYPE OF WELL 2" PVC
STORAGE TANK N.A.
TIME OF START 1130
TIME OF FINISH 1155

DEPTH TO BOTTOM OF WELL	18.0	FT.
DEPTH TO WATER	10.50	FT.
WATER COLUMN	7.5	FT.
VOLUME OF WATER IN WELL	1.2	GAL.
VOLUME OF WATER TO REMOVE	3.6	GAL.
VOLUME REMOVED	3.75	GAL.

RATE OF PURGE 1 gal / min
METHOD OF PURGE hand bailed

PHYSICAL APPEARANCE/COMMENTS matrix spike - HCl reaction Not preserv

FIELD MEASUREMENTS

TIME	pH	COND	TEMP	TURB	Eh	O^2
1145	6.94	3346	10°C	Dark brown Silty	194.3	2.41

TYPES OF SAMPLES COLLECTED
3 VOC (TCL)
1 TAL metals (dissolved)

LABORATORY NAME AND LOCATION
Enesco Somerset NJ

ROUX Consulting Ground-Water Geologists - ROUX ASSOCIATES INC.

WELL SAMPLING DATA FORM

CLIENT Industriplex Site Remedial Trust
PROJECT NO. 046247
LOCATION Woburn, Mass

WELL NUMBER 046254-A
DATE 12/17/91
WEATHER Cloudy and Cold
SAMPLED BY A Factell & C Ware

TYPE OF WELL 2" PVC
STORAGE TANK N.A.
TIME OF START 1420
TIME OF FINISH 1445

DEPTH TO BOTTOM OF WELL	13.5	FT.
DEPTH TO WATER	7.79	FT.
WATER COLUMN	5.71	FT.
VOLUME OF WATER IN WELL	0.91	GAL.
VOLUME OF WATER TO REMOVE	2.74	GAL.
VOLUME REMOVED	2.7	GAL.

RATE OF PURGE 1 gal/min
METHOD OF PURGE hand bailed

PHYSICAL APPEARANCE/COMMENTS
Slightly Silty Smokey grey Color Split w/ EPA

ONE OF OUT * Voa's broke - used one of EPA's
Engine Started near Sampling on This Sample

FIELD MEASUREMENTS

TIME	pH	COND	TEMP	TURB	Eh	O^2
1435	7.14	620	8°C	Smokey	106	3.92

TYPES OF SAMPLES COLLECTED
3 VOC's (TCL)
1 TAL Metals (dissolved)

LABORATORY NAME AND LOCATION
Enesco Somerset NJ

ROUX Consulting Ground-Water Geologists
ROUX ASSOCIATES INC.

WELL SAMPLING DATA FORM

CLIENT Industri-Plex Site Remedial Trust
PROJECT NO. 016024
LOCATION Woburn, Mass

WELL NUMBER MW-54B
DATE 12/17/91
WEATHER Cold and Cloudy
SAMPLED BY [illegible]

TYPE OF WELL 2" PVC
STORAGE TANK N.A.
TIME OF START 1450
TIME OF FINISH 1510

DEPTH TO BOTTOM OF WELL	25.2	FT.
DEPTH TO WATER	8.06	FT.
WATER COLUMN	17.14	FT.
VOLUME OF WATER IN WELL	2.74	GAL.
VOLUME OF WATER TO REMOVE	8.22	GAL.
VOLUME REMOVED	20	GAL.

RATE OF PURGE 10 gal/min
METHOD OF PURGE Centrifugal Pump

PHYSICAL APPEARANCE/COMMENTS
Thick & Oily looking Clear brown Water - like very Sugary Apple Juice
HCl Reaction Not Preser

FIELD MEASUREMENTS

TIME	pH	COND	TEMP	TURB	Eh	O_2
1505	8.08	5110	8°C	brownish clear	-279.9	3.04 (3.04)

TYPES OF SAMPLES COLLECTED
3 VOC (TCL)
1 TAL metals (dissolved)

LABORATORY NAME AND LOCATION
Ensco Somerset, NJ

ROUX Consulting Ground-Water Geologists • ROUX ASSOCIATES INC.

WELL SAMPLING DATA FORM

CLIENT Industry - Plus Site Remedial Trust
PROJECT NO. 216624Y
LOCATION Woburn, Mass

WELL NUMBER OW-54C
DATE 12/17/91
WEATHER Cloudy Cold and Windy
SAMPLED BY A Farrell, T. Wu

TYPE OF WELL 2" PVC
STORAGE TANK N.A.
TIME OF START 1530
TIME OF FINISH 1255

DEPTH TO BOTTOM OF WELL	47.8	FT.
DEPTH TO WATER	7.84	FT.
WATER COLUMN	39.96	FT.
VOLUME OF WATER IN WELL	6.39	GAL.
VOLUME OF WATER TO REMOVE	19.18	GAL.
VOLUME REMOVED	20 gallons	GAL.

RATE OF PURGE 1.5 gal/min
METHOD OF PURGE ~~20 gallons~~ Centrifugal pump

PHYSICAL APPEARANCE/COMMENTS
Foamy. orange - brown rusty clear HCl Reaction - not Preserved
When putting bailer down Seemed to catch on Something and Then break Through — Iced over bailer ball?

FIELD MEASUREMENTS

TIME	pH	COND	TEMP	TURB	Eh	O^2
1345	7.80	5720	9°C	Orangy Clear	135.8	5.70

TYPES OF SAMPLES COLLECTED
3 VOC (TCL)
1 TAL metals (dissolved)

LABORATORY NAME AND LOCATION
Enesco, Somerset NJ

ROUX Consulting Ground-Water Geologists
ROUX ASSOCIATES, INC.

WELL SAMPLING DATA FORM

CLIENT Industri-Plex Site Remedial Trust
PROJECT NO. 016244
LOCATION Woburn, Mass

WELL NUMBER GW 55
DATE 12/18/91
WEATHER Cold Clear Windy
SAMPLED BY A. Farrell C. Wu

TYPE OF WELL 6" steel
STORAGE TANK
TIME OF START 1300
TIME OF FINISH 1530

DEPTH TO BOTTOM OF WELL	73.11	FT.
DEPTH TO WATER	21.00	FT.
WATER COLUMN	52.11	FT.
VOLUME OF WATER IN WELL	76.6	GAL.
VOLUME OF WATER TO REMOVE	~~300~~ 230	GAL.
VOLUME REMOVED	85	GAL.

6" steel = 1.47 gal/ft

RATE OF PURGE 8 gal/min (approximate)
METHOD OF PURGE Submersible pump

PHYSICAL APPEARANCE/COMMENTS

Brown like Tea.

HCl reaction - VOAs not preserved with HCl

Field blank #2
Split w/ EPA

FIELD MEASUREMENTS

TIME	pH	COND	TEMP	TURB	Eh	O_2
1520	7.89	1416	10.00°C	like apple cider.	-54.0.	N/A.

TYPES OF SAMPLES COLLECTED

3 VOC (TCL)

1 Tal metals dissolved

LABORATORY NAME AND LOCATION

Enesco Somerset, NJ

ROUX Consulting Ground-Water Geologists
ROUX ASSOCIATES INC.

WELL SAMPLING DATA FORM

CLIENT Industri-Plex site Remedial Trust
PROJECT NO. 06624Y
LOCATION Woburn, MA

WELL NUMBER OW56A
DATE 12/16/91
WEATHER windy, cloudy COLD
SAMPLED BY M. Smith A. Farrell

TYPE OF WELL 2-inch PVC
STORAGE TANK N.A
TIME OF START ~~0800 PM~~ 1340
TIME OF FINISH 0220 PM 1420

DEPTH TO BOTTOM OF WELL	14.3	FT.
DEPTH TO WATER	7.34	FT.
WATER COLUMN	7.34	FT.
VOLUME OF WATER IN WELL	3.94	GAL.
VOLUME OF WATER TO REMOVE	11.8	GAL.
VOLUME REMOVED	12.0	GAL.

RATE OF PURGE 1 gal/min
METHOD OF PURGE hand Bailed

PHYSICAL APPEARANCE/COMMENTS

Black/Smells like H_2S

NUS (E.P.A.) collected split sample here.

FIELD MEASUREMENTS

TIME	pH	COND	TEMP	TURB	Eh	O^2
0212PM	7.09	2450 MS/cm	7°C	opaque slightly ~~siltly~~ silty	-278	1.80 mg/l

TYPES OF SAMPLES COLLECTED

3 VOC (TCL)
1 TAL Metals (dissolved)

LABORATORY NAME AND LOCATION

Enseco, 2200 Cottontale lane, Somurset, NJ 0887[illegible]

ROUX Consulting Ground-Water Geologists - ROUX ASSOCIATES INC.

WELL SAMPLING DATA FORM

CLIENT Industri-Plex Site Remedial Trust
PROJECT NO. 06624V
LOCATION Woburn, MA

WELL NUMBER UW 56B
DATE 12-16-91
WEATHER COLD 20°F light breeze
SAMPLED BY M. Smith, A. Farrell

TYPE OF WELL 2" PVC
STORAGE TANK N.A.
TIME OF START 1440
TIME OF FINISH 1500

DEPTH TO BOTTOM OF WELL	~~32.0~~ 26.0	FT.
DEPTH TO WATER	~~7.37~~ 6.95	FT.
WATER COLUMN	~~7.37~~ 6.195	FT.
VOLUME OF WATER IN WELL	~~5.94~~ 3.05	GAL.
VOLUME OF WATER TO REMOVE	~~11.8~~ 9.15	GAL.
VOLUME REMOVED	~~12.0~~ 10.0	GAL.

RATE OF PURGE 1 gal/min
METHOD OF PURGE hand bailed

PHYSICAL APPEARANCE/COMMENTS
brown, foamy, H_2S smell

FIELD MEASUREMENTS

TIME	pH	COND	TEMP	TURB	Eh	O^2
0245/PM	7.09	10960	6°C	v. slightly cloudy	-146.1	1.15 mg/L

TYPES OF SAMPLES COLLECTED 3 TCL Volatile Organic Compounds
1 TAL Metals

LABORATORY NAME AND LOCATION ENSECO - EAST
Somerset, NJ.

ROUX Consulting Ground-Water Geologists - ROUX ASSOCIATES Inc.

WELL SAMPLING DATA FORM

CLIENT Industri-Plex Site Remedial Trust
PROJECT NO. 06624Y
LOCATION Wedburn, MA

WELL NUMBER OW-56C
DATE 12-16-91
WEATHER Cold ~20°F light breeze
SAMPLED BY M. Smith A Farrell

TYPE OF WELL 2" PVC
STORAGE TANK N.A.
TIME OF START 1520
TIME OF FINISH 1540

DEPTH TO BOTTOM OF WELL	32.0	FT.
DEPTH TO WATER	7.37	FT.
WATER COLUMN	7.37	FT.
VOLUME OF WATER IN WELL	3.94	GAL.
VOLUME OF WATER TO REMOVE	11.8	GAL.
VOLUME REMOVED	12.0	GAL.

RATE OF PURGE 1 gal/min
METHOD OF PURGE Hand Bailed

PHYSICAL APPEARANCE/COMMENTS OW-100 collected as replicate here.

FIELD MEASUREMENTS

TIME	pH	COND	TEMP	TURB	Eh	O^2
1540	6.57	12690	4°C		-63.2	1.72 mg

TYPES OF SAMPLES COLLECTED 3 TCL volatile organic compounds
1 TAL metals

LABORATORY NAME AND LOCATION ENSECO - East
Somerset, NJ

ROUX Consulting Ground-Water Geologists · ROUX ASSOCIATES INC.

WELL SAMPLING DATA FORM

CLIENT ~~06624~~ ISRT
PROJECT NO. 06624X
LOCATION Woburn, MA

WELL NUMBER WP-1
DATE 12-19-91
WEATHER COLD ~20°F Sunny
SAMPLED BY A. Farrell, C. Wu

TYPE OF WELL well point - 2" steel
STORAGE TANK N.A.
TIME OF START 1155
TIME OF FINISH 1215

DEPTH TO BOTTOM OF WELL	~~12.6~~ 10.56	FT.
DEPTH TO WATER	8.88	FT.
WATER COLUMN	1.68	FT.
VOLUME OF WATER IN WELL	0.27	GAL.
VOLUME OF WATER TO REMOVE	0.82	GAL.
VOLUME REMOVED	1.0	GAL.

RATE OF PURGE
METHOD OF PURGE bailed-hand

PHYSICAL APPEARANCE/COMMENTS

FIELD MEASUREMENTS

TIME	pH	COND	TEMP	TURB	Eh	O^2
1155	6.77	2190	6°C	Cloudy brown-grey Silty	54.6	7.00

TYPES OF SAMPLES COLLECTED
3 TCL Volatile Organic Compounds
1 TAL Metals dissolved

LABORATORY NAME AND LOCATION
ENSECO East Somerset, New Jersey

ROUX Consulting Ground-Water Geologists · ROUX ASSOCIATES INC.

WELL SAMPLING DATA FORM

CLIENT ISRT- Industri-Plex Site Remedial Trust
PROJECT NO. 06624V
LOCATION Woburn, Massachusetts

WELL NUMBER WP-3
DATE 12/19/91
WEATHER Cold, approx. 20°F, Sunny
SAMPLED BY A. Farrell, J. Matuski

TYPE OF WELL 2" steel well point
STORAGE TANK N.A.
TIME OF START 1230
TIME OF FINISH 1255

DEPTH TO BOTTOM OF WELL	13.08	FT.
DEPTH TO WATER	5.05	FT.
WATER COLUMN	8.03	FT.
VOLUME OF WATER IN WELL	1.31	GAL.
VOLUME OF WATER TO REMOVE	3.9	GAL.
VOLUME REMOVED	4.5	GAL.

RATE OF PURGE
METHOD OF PURGE Hand Bailed

PHYSICAL APPEARANCE/COMMENTS

FIELD MEASUREMENTS

TIME	pH	COND	TEMP	TURB	Eh	O_2
1230	7.30	5100 (5100)	7°C	very silty, brown	-28.7	1.33

TYPES OF SAMPLES COLLECTED

3 TCL volatile organic compounds
1 TAL dissolved metals

LABORATORY NAME AND LOCATION

ENSECO-East, Somerset, New Jersey

ROUX Consulting Ground-Water Geologists
ROUX ASSOCIATES INC.

WELL SAMPLING DATA FORM

CLIENT Industri-plex Site Remidial Trust
PROJECT NO. 0616244
LOCATION Woburn, Mass

WELL NUMBER WP-4
DATE 12/19/91
WEATHER Cold and Clear
SAMPLED BY A. Ferrell J. Makowski

TYPE OF WELL Well Point 2"
STORAGE TANK N.A.
TIME OF START 1410
TIME OF FINISH 1500

DEPTH TO BOTTOM OF WELL	13.06	FT.
DEPTH TO WATER	6.53	FT.
WATER COLUMN	6.53	FT.
VOLUME OF WATER IN WELL	1.07	GAL.
VOLUME OF WATER TO REMOVE	3.20	GAL.
VOLUME REMOVED	4	GAL.

RATE OF PURGE
METHOD OF PURGE Hand bailed

PHYSICAL APPEARANCE/COMMENTS

Strong H_2S Odor
Silty
Split w/ EPA
NOT PRESERVED!

FIELD MEASUREMENTS

TIME	pH	COND	TEMP	TURB	Eh	O^2
1445	7.46	6290	10°	Smokey grey	-314.3	0.37

TYPES OF SAMPLES COLLECTED

3 ~~VOC~~ TCL Volatile Organic Compounds
1 TAL metals (dissolved)

LABORATORY NAME AND LOCATION

Ensco Somerset, NJ

ROUX Consulting Ground-Water Geologists • ROUX ASSOCIATES INC.

WELL SAMPLING DATA FORM

CLIENT ISRT - Industri-Plex Site Remedial Trust
PROJECT NO. 06624Y
LOCATION Woburn, MA

WELL NUMBER WP5
DATE 12/19/91
WEATHER Freezing COLD, sunny
SAMPLED BY A. Farrell C. Wu

TYPE OF WELL 2" MWP
STORAGE TANK N.A.
TIME OF START 0950
TIME OF FINISH 1005

DEPTH TO BOTTOM OF WELL	7.93	FT.
DEPTH TO WATER	3.65	FT.
WATER COLUMN	4.28	FT.
VOLUME OF WATER IN WELL	0.70	GAL.
VOLUME OF WATER TO REMOVE	2.10	GAL.
VOLUME REMOVED	2.5	GAL.

RATE OF PURGE
METHOD OF PURGE Hand Bailed

PHYSICAL APPEARANCE/COMMENTS

Dark Brown & cloudy

Field Replicate OW-101 collected at WP-5

FIELD MEASUREMENTS

TIME	pH	COND	TEMP	TURB	Eh	O^2
1000	6.70	3110	8°C	cloudy	(-68.3) -68.3	2.74

TYPES OF SAMPLES COLLECTED

3 TCL Volatile Organic Compounds
1 TAL dissolved metals

LABORATORY NAME AND LOCATION

ENESCO - East Somerset, New Jersey

APPENDIX B4

Ground-Water
Chain of Custody Forms

Cust # 16790

ROUX

CHAIN OF CUSTODY SURFACE - WATER

Consulting Ground-Water Geologists & Engineers
ROUX ASSOCIATES INC
775 PARK AVENUE
SUITE 255
HUNTINGTON, NEW YORK 11743

ANALYSES — Page 1 of 3

Project Name: GSIP - Phase 2
Project Number: 066244
Project Location: INDUSTRIPLEX SITE, WOBURN, MA
Sampler(s): D. Ascheman, S. Clough (ES+E)

	Sample Designation/Location	Date Collected	Time Collected	TCL volatile organic compounds in 40 ml glass vial, preserved with HCl, Chilled.	TCL semi-VOA in 1 liter amber glass, chilled to 4°C	TAL Metals TOTAL in 1 liter poly bottle, preserved with HNO_3, Chilled	TAL Metals DISSOLVED in 1 liter poly bottle, filtered, preserved with HNO_3, Chilled.	TOC in 125 glass bottle preserved with H_2SO_4, Chilled.	TSS in 500 ml poly bottle, chilled.	TOTAL BOTTLES	NOTES
1	SW-18	10-2-91	1140	3	2	1	1	1	1	7	
2	SW-24	10-2-91	1530	3	2	1	1	1	1*	9	
3	SW-19	10-2-91	1300	3						3	
4	SW-100	10-2-91	—	3						3	38 bottles
5	Trip Blank	10-1-91		3						3	total in
											cooler
											Recd Good 10/3/91
										18	

* NOT RECEIVED (initials) 10/4/91

Relinquished by:(Signature)	For	Date	Time	Received by:(Signature)	For	Date	Time
Martha M. Smith	ROUX	10-2-91	1900	J. Vergnud	Cust	10/3/91	9:00

Delivery Method: Fed. Ex
Airbill # 3266911060

Comments:

Chest # 16790

ROUX

CHAIN OF CUSTODY

STREAM SEDIMENT

Consulting Ground-Water Geologists & Engineers
ROUX ASSOCIATES INC
775 PARK AVENUE
SUITE 255
HUNTINGTON, NEW YORK 11743

ANALYSES

Project Name: GSIP Phase 2
Project Number: 06624Y
Project Location: INDUSTRIPLEX SITE, WOBURN, MA
Sampler(s): D. Aschemann, S. Clough (ES&E)

Sample Designation/Location	Date Collected	Time Collected	TCL VOA in 125 ml glass jar (Chilled)	TCL Semi VOA in 250 ml glass jar (Chilled)	TAL Metals in 250 ml glass jar (Chilled)	TOC in 250 ml glass jar (Chilled)	Ammonia in 250 ml glass jar (Chilled)	PH in 250 ml glass jar (Chilled)	TOTAL BOTTLES	NOTES
(6) SED-18	10-2-91	1200	1	1	1	1	1	1	6	
(7) SED-24	10-2-91	1540	1	1	1	1	1	1	6	
(8) SED-19	10-2-91	1330	1						1	Rec'd Good @ 10/3/91
(9) SED-100	10-2-91	—	1						1	
									14	

Relinquished by:(Signature)	For	Date	Time	Received by:(Signature)	For	Date	Time
Martha M. Smith	ROUX	10-2-91	1900	J. Vaquera	Chest	10/3/91	9:00
Relinquished by:(Signature)	For	Date	Time	Received by:(Signature)	For	Date	Time
Relinquished by:(Signature)	For	Date	Time	Received by:(Signature)	For	Date	Time

Delivery Method: Fed EX airbill # 3266911060

Comments:

Client # 16 FPD

ROUX

CHAIN OF CUSTODY

STREAM SEDIMENT

Consulting Ground-Water Geologists & Engineers
ROUX ASSOCIATES INC
775 PARK AVENUE
SUITE 255
HUNTINGTON, NEW YORK 11743

ANALYSES

Project Name: GSIP Phase 2

Project Number: 06624Y

Project Location: Industri-Plex Site, Woburn, MA

Sampler(s): D. Ashmun, S. Clough (ES&E)

Sample Designation/Location	Date Collected	Time Collected	Sulfide (Total) in 250 ml glass jar Chilled	Eh in 250 ml glass jar Chilled	Grain Size Analysis in 1.5 pint glass jar Chilled	Grain Size Analysis in 250 ml glass jar Chilled			TOTAL BOTTLES	NOTES
(6) SED-18	10-2-91	1200	1	1		1			3	
(7) SED-24	10-2-91	1540	1	1	1				3	
										38 bottles total in cooler
										Received Good 10/3/91
									6	

Relinquished by:(Signature)	For	Date	Time	Received by:(Signature)	For	Date	Time
Martha M. Smith	ROUX	10-2-91	1906				
Relinquished by:(Signature)	For	Date	Time	Received by:(Signature)	For	Date	Time
Relinquished by:(Signature)	For	Date	Time	Received by:(Signature)	For	Date	Time

Delivery Method: FED EX AIR BILL # 3266 911060

Comments:

Cust # 16790

ROUX

CHAIN OF CUSTODY

SURFACE - WATER

Consulting Ground-Water Geologists & Engineers
ROUX ASSOCIATES INC
775 PARK AVENUE
SUITE 255
HUNTINGTON, NEW YORK 11743

ANALYSES **Page 1 of 3**

Project Name: GSIP - Phase 2
Project Number: C86624 Y
Project Location: Industri-Plex Site, Woburn, MA
Sampler(s): D. Ashburn, S. Clough (ES+E)

	Sample Designation/Location	Date Collected	Time Collected	TCL VOCs in 40 ml glass vial, preserved with HCl, Chilled.	TCL Semi VOAs in 1 liter amber glass, Chilled	TAL Metals TOTAL in 1 liter poly bottle preserved with HNO3, Chilled	TAL Metals Dissolved in 1 liter poly bottle, filtered, preserved with HNO3, Chilled	TOC in 125 ml glass bottle, preserved with H2SO4, Chilled.	TSS in 500 ml poly bottle, Chilled	TOTAL BOTTLES	NOTES
3	SW-19	10-2-91	1300		1 Zms	1	1	1	1*	6	m+5
4	SW-100	10-2-91	—		2	1	1	1	1*	6	

*NOT RECEIVED (initials) 10/9/91

27 bottles total in cooler

Recd Good Jr 10/3/91

Relinquished by:(Signature)	For	Date	Time	Received by:(Signature)	For	Date	Time
Martha M. Smith	ROUX	10-2-91	1900	J. Vergura	Keystone Cust	10/3/91	9:00

Delivery Method: Fed Ex
Airbill # 3266911056

Comments:

Cust 16790

ROUX

CHAIN OF CUSTODY

STREAM SEDIMENT

Consulting Ground-Water Geologists & Engineers
ROUX ASSOCIATES INC
775 PARK AVENUE
SUITE 255
HUNTINGTON, NEW YORK 11743

Project Name: GSIP Phase 2
Project Number: 06624Y
Project Location: INDUSTRIPLEX SITE, Woburn, MA
Sampler(s): D. Ashenman, S. Clough (ESE)

Sample Designation/Location	Date Collected	Time Collected	TCL VOA in 125 ml glass jar	TCL Semi VOA in 250 ml glass jar Chilled	TAL Metals in 250 ml glass jar Chilled	TOC in 250 ml glass jar Chilled	Ammonia in 250 ml glass jar Chilled	PH in 250 ml glass jar	TOTAL BOTTLES	NOTES
SED-19	10-2-91	1330		1	1	1	1	1	5	
SED-100	10-2-91	—		1	1	1	1	1	5	

27 bottles total in cooler

Dena Greco 10/3/91

Relinquished by:(Signature)	For	Date	Time	Received by:(Signature)	For	Date	Time
Martha M Smith	ROUX	10-2-91	1900	J. Vaughan	Cust	10/3/91	9:00

Delivery Method: Fed Ex Air bill # 3266911056
Comments:

Cost # 16790

ROUX

CHAIN OF CUSTODY

STREAM - SEDIMENT

Consulting Ground-Water Geologists & Engineers
ROUX ASSOCIATES INC
775 PARK AVENUE
SUITE 255
HUNTINGTON, NEW YORK 11743

Project Name: GSIP - Phase 2
Project Number: 06624Y
Project Location: Industri-Plex Site, Woburn MA
Sampler(s): D. Ashuman, S. Clough (ESIE)

	Sample Designation/Location	Date Collected	Time Collected	ANALYSES: Total Sulfide in 250ml glass jar Chilled	Eh in 250ml glass jar	Grain Size Analysis in 1 Liter plastic glass jar. Chilled.				TOTAL BOTTLES	NOTES
(8)	SED-19	10-2-91	1330	1	1	1				3	
(9)	SED-100	10-2-91	—	1	1	1				3	
											27 ~~28~~ bottles total in cooler
											Reddy Gorke 10/3/91

Relinquished by:(Signature)	For	Date	Time	Received by:(Signature)	For	Date	Time
				J. Ungura	Rosco Cust	10/3/91	9:00
Relinquished by:(Signature)	For	Date	Time	Received by:(Signature)	For	Date	Time
Relinquished by:(Signature)	For	Date	Time	Received by:(Signature)	For	Date	Time

Delivery Method: Fed Ex Airbill # 326671105C
Comments:

CAST 110811

SURFACE WATER

CHAIN OF CUSTODY

ROUX

Consulting Ground-Water Geologists & Engineers

ROUX ASSOCIATES INC

775 PARK AVENUE
SUITE 255
HUNTINGTON, NEW YORK 11743

Project Name: GSIP- Phase 2

Project Number: 06624Y

Project Location: Industri-Plex Site, Woburn, MA

Sampler(s): D. Aschman, S. Clough (ESE)

ANALYSES

Sample Designation/Location	Date Collected	Time Collected	TCL VOA in 40ml glass vials. HCl preserved. Chilled	TCL semi VOA's in 1L amber glass. Chilled.	TAL metals TOTAL in 1L poly bottle HNO3 preserved. Chilled	TAL metals DISSOLVED in 1L poly filtered. HNO3 preserved. Chilled	TOC in 125 ml glass H2SO4 preserved Chilled	TSS in 500ml poly Chilled.	TOTAL BOTTLES	NOTES
~~Field Blank 1 - Sediments~~	~~10-3-91~~	~~1330~~								D. Aschman 10-3-91
Field Blank 1 - Sediments	10-3-91	1330		2	1		1		4	
Field Blank 1 - Water	10-3-91	1700				1	1		1	
SW23	10-3-91	1045		2			1		3	(14) MATRIX SPIKE
SW23MS	10-3-91	1045		2			1		3	
SW23MSD	10-3-91	1045		2			1		3	MATRIX SPIKE DUPLICATE

Rich Goodyear 10/5/91

Relinquished by:(Signature)	For	Date	Time	Received by:(Signature)	For	Date	Time
D. Aschman	ROUX	10-3-91	2000	[signature]	CAST	10/4/91	9:52
Relinquished by:(Signature)	For	Date	Time	Received by:(Signature)	For	Date	Time
Relinquished by:(Signature)	For	Date	Time	Received by:(Signature)	For	Date	Time

Delivery Method: FedEx Airbill # 3246912954

Comments: 17 bottles total in cooler

CAST 16811

STREAM SEDIMENT

ROUX

CHAIN OF CUSTODY

Consulting Ground-Water Geologists & Engineers

ROUX ASSOCIATES INC

775 PARK AVENUE
SUITE 255
HUNTINGTON, NEW YORK 11743

Project Name GSIP. Phase 2

Project Number 06624Y

Project Location Industri-Plex Site, Woburn MA

Sampler(s): D. Aichman, S. Clough (ESE)

ANALYSES

Sample Designation/Location	Date Collected	Time Collected	TCL VOA in 125ml glass jar (chilled)	TCL Semi-VOA in 250 ml glass jar (chilled)	TAL metals in 250 ml glass (chilled)	TCL in 250 ml glass (chilled)	Ammonia in 250 ml glass (chilled)	pH in 250 ml glass	TOTAL BOTTLES	NOTES
(1-1) Field Blank 1 - Sediments	10-3-91	1330					1		1	

(1)

10/5/91

Relinquished by:(Signature)	For	Date	Time	Received by:(Signature)	For	Date	Time
D. P. Aichman	ROUX	10-3-91	2000	J. Vaughan	Chris West	10/4/91	9:50
Relinquished by:(Signature)	For	Date	Time	Received by:(Signature)	For	Date	Time
Relinquished by:(Signature)	For	Date	Time	Received by:(Signature)	For	Date	Time

Delivery Method Fed Ex Airbill # 3266912994

Comments

CAST 16811

STREAM SEDIMENTS

ROUX

CHAIN OF CUSTODY

Consulting Ground-Water Geologists & Engineers
ROUX ASSOCIATES INC
775 PARK AVENUE
SUITE 255
HUNTINGTON, NEW YORK 11743

ANALYSES

Project Name: GSIP Phase 2

Project Number:

Project Location: Industri-Plex Site, Woburn MA

Sampler(s): D. Aschman, S Clough (ES&E)

Sample Designation/Location	Date Collected	Time Collected	Total Sulfide in 250 ml glass jar Chilled	Eh in 250 ml glass jar	grain size analysis in 1 qt glass mason jar Chilled	Total Sulfide in 500ml poly NaOH preserved Chilled	pH in 500 ml poly Chilled	TOTAL BOTTLES	NOTES
(4) Field Blank 1- Sediments	10-3-91	1330				1	1	2	
									(2) Rec'd Good JA 10/5/91

Relinquished by:(Signature)	For	Date	Time	Received by:(Signature)	For	Date	Time
D Aschman	ROUX	10-3-91	2000	J. Vinquist	Cast	10/4/9	9:50
Relinquished by:(Signature)	For	Date	Time	Received by:(Signature)	For	Date	Time
Relinquished by:(Signature)	For	Date	Time	Received by:(Signature)	For	Date	Time

Delivery Method: FedEx Airbill # 3266912994

Comments:

Cast # 16811

Surface Water

CHAIN OF CUSTODY

ROUX

Consulting Ground-Water Geologists & Engineers

ROUX ASSOCIATES INC

775 PARK AVENUE
SUITE 255
HUNTINGTON, NEW YORK 11743

Project Name GSLP Phase 2

Project Number 06624Y

Project Location Industri-Plex Site, Woburn MA

Sampler(s): D. Aschman, S. Clough (ESE)

ANALYSES

Sample Designation/Location	Date Collected	Time Collected	TCL VOA in 40 ml glass vial, HCl preserved, Chilled	TCL Semi VOA's in 1L Amber glass, Chilled	TAL Metals TOTAL in 1L poly bottle, HNO3 preserved, Chilled	TAL Metals DISSOLVED in 1L poly, filtered, HNO3 preserved, Chilled	TOC in 125 ml glass, H2SO4 preserved, Chilled	TSS in 500 ml poly, Chilled	TOTAL BOTTLES	NOTES
SW 23	10-3-91	1045			1	1		1	3	
SW 23 MS	10-3-91	1045			1	1		1	3	
SW 23 MSD	10-3-91	1045			1	1		1	3	
SW 21	10-3-91	1530				1			1	
										(10)
										Kyle Lloyd 10/5/91

Relinquished by:(Signature)	For	Date	Time	Received by:(Signature)	For	Date	Time
D P Aschman	Roux	10-3-91	2000		Client	10/4/91	9:50

Delivery Method Fed Ex Airbill #326691108 2

Comments (33) bottles total in cooler

Cast 116811

STREAM SEDIMENT ~~SURFACE WATER~~ CA

CHAIN OF CUSTODY

ROUX

Consulting Ground-Water Geologists & Engineers

ROUX ASSOCIATES INC

775 PARK AVENUE
SUITE 255
HUNTINGTON, NEW YORK 11743

Project Name GSIP. Phase 2

Project Number 06624Y

Project Location Industriplex Site, Woburn MA

Sampler(s): D. Aschman, S. Clough (ESE)

ANALYSES

Sample Designation/Location	Date Collected	Time Collected	TCL VOA in 125ml glass jar chilled	TCL & Semi-VOA in 250 ml glass jar chilled	TAL metals in 250 ml glass chilled	TOC in 250 ml glass chilled	Ammonia in 250 ml glass chilled	pH in 250 ml glass	TOTAL BOTTLES	NOTES
(11) SED 23	10-3-91	1120		1	1	1	1	1	5	
(11) SED 23 MS	10-3-91	1120		1	1	1	1	1	5	
(11) SED 23 MSD	10-3-91	1120		1	1	1	1	1	5	
										(15) Rec'd Good 10/5/91

Relinquished by:(Signature)	For	Date	Time	Received by:(Signature)	For	Date	Time
D. Aschman	Roux	10-3-91	8:00pm		Client	10/4/91	9:50

Delivery Method Fed Ex Airbill # 3266911082

Comments

Cast 16811

ROUX

CHAIN OF CUSTODY

STREAM SEDIMENT ~~SURFACE WATER~~ DG

Consulting Ground-Water Geologists & Engineers
ROUX ASSOCIATES INC
775 PARK AVENUE
SUITE 255
HUNTINGTON, NEW YORK 11743

Project Name: GSIP. Phase 2
Project Number: 06624Y
Project Location: Industri-Plex Site, Woburn MA
Sampler(s): D. Ashman, S. Clough (ESE)

ANALYSES

Sample Designation/Location	Date Collected	Time Collected	TOTAL SULFIDE IN 250 ml GLASS JAR CHILLED	Eh IN 250 ml GLASS JAR	GRAIN SIZE ANALYSIS IN 1 QT GLASS JAR. Chilled				TOTAL BOTTLES	NOTES
SED 23	10-3-91	1120	1	1	1				3	
SED 23 MS	10-3-91	1120	1	1					2	
SED 23 MSD	10-3-91	1120	1	1					2	
SED 21	10-3-91	1545	1						1	
										(8) Kevin Dunn 10/5/91

Relinquished by:(Signature)	For	Date	Time	Received by:(Signature)	For	Date	Time
D. P. Ashman	Roux	10-3-91	2000	J. Vaughan	Quest	10-4-91	9:50
Relinquished by:(Signature)	For	Date	Time	Received by:(Signature)	For	Date	Time
Relinquished by:(Signature)	For	Date	Time	Received by:(Signature)	For	Date	Time

Delivery Method: Fed Ex Airbill # 3266911052

Comments:

CAST # 16811

ROUX

CHAIN OF CUSTODY

SURFICE WATER

Consulting Ground-Water Geologists & Engineers
ROUX ASSOCIATES INC
775 PARK AVENUE
SUITE 255
HUNTINGTON, NEW YORK 11743

Project Name: GSIP - Phase 2
Project Number: 06624Y
Project Location: Industri-Plex Site, Woburn MA
Sampler(s): D. Aschman, S. Clough (ESE)

Sample Designation/Location	Date Collected	Time Collected	TCL VOAs in 40ml glass vial, HCl preserved, Chilled	TCL semi VOAs in 1L amber glass, Chilled	TAL Metals TOTAL in 1L poly bottle, HNO3 preserved, chilled	THL Metals DISSOLVED in 1L poly, filtered, HNO3 preserved, chilled	TOC in 125ml glass. H2SO4 preserved. Chilled	TSS in 500ml poly Chilled	TOTAL BOTTLES	NOTES
SW-22	10-3-91	1250	3	2	1	1	1	1	9	
SW-19	10-3-91	1540						1	1	
SW-100	10-3-91	—						1	1	
Field Blank - 1 Sed	10-3-91	1330	3						3	
Trip Blank			3						3	(3)
SW 23	10-3-91	1045	2						2	
SW23 MS	10-3-91	1045	~~2~~ 3						2	
SW 23 MSD	10-3-91	1045	2						2	
SW 21	10-3-91	1530	3	2	1		1	1	8	

Red Goode 10/5/91

Relinquished by:(Signature)	For	Date	Time	Received by:(Signature)	For	Date	Time
D.V. Allen	ROUX	10-3-91	2000	J. Vergura	Case Cust	10/4/91	9:50

Delivery Method: Fed Ex
Airbill # 326911023

Comments: (51) Bottles total in cooler

CAST 16811

STREAM SEDIMENT ~~Surface Water~~

ROUX

CHAIN OF CUSTODY

Consulting Ground-Water Geologists & Engineers
ROUX ASSOCIATES INC
775 PARK AVENUE
SUITE 255
HUNTINGTON, NEW YORK 11743

Project Name: GSIP- Phase 2
Project Number: 06624Y
Project Location: Industri-Plex Site, Woburn, MA
Sampler(s): D. Aschmen, S. Clough (ES&E)

ANALYSES

Sample Designation/Location	Date Collected	Time Collected	TCL VOA in 125 ml glass jar chilled	TCL Semi VOA in 250 ml glass jar chilled	TAL Metals in 250 ml glass. chilled	TOC in 250 ml glass. chilled	Ammonia in 250 ml glass. chilled	pH in 250 ml glass.	TOTAL BOTTLES	NOTES
~~SW~~ SED-22	10-3-91	1250	1	1	1	1	1	1	6	
SED-23	10-3-91	1120	1						1	
SED 23MS	10-3-91	1120	1						1	
SED 23 MSD (VOA)	10-3-91	1120	1						1	
SED 21	10-3-91	1545	1	1	1	1	1	1	6	(TS)
										Neil Wood 10/5/91

Relinquished by:(Signature)	For	Date	Time	Received by:(Signature)	For	Date	Time
D.P. Aschmen	ROUX	10-3-91	2000	J. Vaughn	Cast	10/4/91	9:50

Delivery Method: Fed Ex Airbill # 3266911023

Comments:

CAST 16811

ROUX

CHAIN OF CUSTODY STREAM SEDIMENT ~~SURFACE WATER~~ LA

Consulting Ground-Water Geologists & Engineers
ROUX ASSOCIATES INC
775 PARK AVENUE
SUITE 255
HUNTINGTON, NEW YORK 11743

Project Name: GSP - Phase 2
Project Number: 06624Y
Project Location: Industri-Plex Site, Woburn MA
Sampler(s): D. Aschman, S. Clough (ESE)

ANALYSES

Sample Designation/Location	Date Collected	Time Collected	Total sulfide in 250 ml glass jar chilled	Eh in 250 ml glass jar	Grain Size Analysis in 1.5 pint glass mason jar chilled				TOTAL BOTTLES	NOTES
(9) SED-22	10-3-91	1250	1	1	1				3	
(6) SED-21	10-3-91	1545		1	1				2	
			1							(5)
			1							Kyle Gova 10/5/91
			1							

Relinquished by:(Signature)	For	Date	Time	Received by:(Signature)	For	Date	Time
D.P. Allen	ROUX	10-3-91	2000	Virginia	Client	10/4/91	9:50
Relinquished by:(Signature)	For	Date	Time	Received by:(Signature)	For	Date	Time
Relinquished by:(Signature)	For	Date	Time	Received by:(Signature)	For	Date	Time

Delivery Method: Fed Ex Airbill # 3266911023
Comments:

APPENDIX B5

Surface-Water and Stream-Sediment
Sampling Forms and
Chain of Custody Forms

APPENIDX B5

Surface-Water and Stream-Sediment
Sampling Forms

SURFACE WATER SAMPLING

ROUX ASSOCIATES, INC.
PROJECT #06624Y, ISRT GSIP-2

Sampling Location: SW-18 Between R.R tracks and spur, 3 boxcars W of culvert mark "R.F."

Date: 10-2-91 Weather: Pt Cloudy 70°

Time: 1142 Collector's Initials: DPA/SRC

Stream Width: 3 ft

Stream Depth: 6-8" ft

Cross Sectional Area: 1.5 ft²

Water Samples Collected For:	Yes/No		Comments
TCL VOCs	✓		SW-18 1142
TCL Semi-VOCs	✓		
TAL Metals (dissolved)	✓		
TAL Metals (total)	✓		
TSS	✓		
TOC	✓		

Sample Collection Method: Grab sample

Field Measurements:

TEMP	pH	COND	Eh	O_2	Color	Clarity	Odor
Calibration ~~19°C~~ (in situ) 16.8°C @ 20°	5.30 @ 19°C	974 @ 19°C	29	8.03	light tan	clear	slight organic/ sulfide

ORP.

Additional Information: Sediment

5 dredge samples composited: 4 @ brown sand, 1 @ black sludge

Net composite is black, oily.

ROUX ASSOCIATES, INC.
PROJECT #06624Y, ISRT GSIP-2

Sampling Location: SW-1B

Sediment Samples Collected For:	Yes/No		Comments
TCL VOCs	✓		SED-1B 1200
TCL Semi-VOCs	✓		
TAL Metals, Tin	✓		
pH, Eh	✓		
Grain Size Analysis	✓		
TOC	✓		
Sulfide	✓		
Ammonia	✓		

Sample Collection Method: Ponar dredge grab sample composite

Sediment Description:

Composite of 5 Ponar dredge samples
4 à brown sand, some plant matter
5 à black silty sludge

SURFACE WATER SAMPLING

ROUX ASSOCIATES, INC.
PROJECT #06624Y, ISRT GSIP-2

Sampling Location: SW-19 Duck Pond

Date: 10-2-91 Weather: Sunny 75°

Time: 1.00 Collector's Initials: DPA / SRC

Stream Width: 60 ft

Stream Depth: 0.5 - 1.0 ft

Cross Sectional Area: ~ 40 ft²

wetlands heavily vegetated, multiple stream channels.

Water Samples Collected For:	Yes/No	Comments
TCL VOCs	✓	
TCL Semi-VOCs	✓	
TAL Metals (dissolved)	✓	
TAL Metals (total)	✓	
TSS	✓	
TOC	✓	

Sample Collection Method: GRAB

Field Measurements:

TEMP	pH	COND	Eh	O_2	Color	Clarity	Odor
18°C	5.23	340	~~TAB~~ 124 Ca		Slightly yellow	clear	none
15.4 in situ			7.31				

Additional Information:

Field Replicate collected and labeled "SW-100"

ROUX ASSOCIATES, INC.
PROJECT #06624Y, ISRT GSIP-2

Sampling Location: OW-19 Duck Pond

Sediment Samples Collected For:	Yes/No		Comments
TCL VOCs	✓		
TCL Semi-VOCs	✓		
TAL Metals, Tin	✓		
pH, Eh	✓		
Grain Size Analysis	✓		
TOC	✓		
Sulfide	✓		
Ammonia	✓		

Sample Collection Method: Ponar grab sampler

Sediment Description: 4 DP
Composite: ~~2~~ dredges from center: medium brown SAND
3 DP ~~2~~ dredges from North shore: dark brown silts, high organic content - rich peaty muck

needed enough sediment for duplicate (replicates - SW100)

Additional Information:

SURFACE WATER SAMPLING

ROUX ASSOCIATES, INC.
PROJECT #06624Y, ISRT GSIP-2

Sampling Location: SW-21 Behind Digital, 150' S of berm

Date: 10.3.91 Weather: Overcast, 70°

Time: 1530 Collector's Initials: SC/DPA

Stream Width: ~~30~~ 25 ft

Stream Depth: 0.7-1.0 ft

Cross Sectional Area: _____ ft ^{2}

Water Samples Collected For:	Yes/No		Comments
TCL VOCs	✓		
TCL Semi-VOCs	✓		
TAL Metals (dissolved)	✓		
TAL Metals (total)	✓		
TSS	✓		
TOC	✓		

Sample Collection Method: GRAB

Field Measurements:

	TEMP	pH	COND	Eh	O_2	Color	Clarity	Odor
YSI in situ	(15.5°) ✓	~~6~~6.21	495		7.41	Slightly yellow	clear	none
	19 C			147				

Additional Information:

ROUX ASSOCIATES, INC.
PROJECT #06624Y, ISRT GSIP-2

Sampling Location: SW-21

Sediment Samples Collected For:	Yes/No		Comments
TCL VOCs	✓		
TCL Semi-VOCs	✓		
TAL Metals, Tin	✓		
pH, Eh	✓		
Grain Size Analysis	✓		
TOC	✓		
Sulfide	✓		
Ammonia	✓		

Sample Collection Method: PONAR DREDGE - COMPOSITE

Sediment Description:

Black organic silt and vegetative detritus, sticks, trace sand (almost none).

Additional Information:

SURFACE WATER SAMPLING

ROUX ASSOCIATES, INC.
PROJECT #06624Y, ISRT GSIP-2

Sampling Location: SW 22

Date: 10-3-91 Weather: Cloudy, 70°

Time: 12:45 Collector's Initials: SC/DPA

Stream Width: 25 ft wetland 300' wide

Stream Depth: 0.5-1.0 ft

Cross Sectional Area: _____ ft ^{2}

Water Samples Collected For:	Yes/No		Comments
TCL VOCs	✓		
TCL Semi-VOCs	✓		
TAL Metals (dissolved)	✓		
TAL Metals (total)	✓		
TSS	✓		
TOC	✓		

Sample Collection Method: GRAB

Field Measurements:

TEMP	pH	COND	Eh	O_2	Color	Clarity	Odor
18.5°	4.83	477	104 ± 5mv		slightly	clear	none
19.5°	5.16		130 ± 1mv		yellow		
(15.9)				5.92			

YSI in situ

Additional Information:

ROUX ASSOCIATES, INC.
PROJECT #06624Y, ISRT GSIP-2

Sampling Location: SW 22

Sediment Samples Collected For:	Yes/No		Comments
TCL VOCs	✓		
TCL Semi-VOCs	✓		
TAL Metals, Tin	✓		
pH, Eh	✓		
Grain Size Analysis	✓		
TOC	✓		
Sulfide	✓		
Ammonia	✓		

Sample Collection Method: Ponar dredge - composite sample

Sediment Description:

Black/Brown silt, some grasses, twigs, trace sand.

Additional Information:

SURFACE WATER SAMPLING

ROUX ASSOCIATES, INC.
PROJECT #06624Y, ISRT GSIP-2

Sampling Location: SW 23

Date: 10/3/91 Weather: Cloudy. 70°

Time: 1045 Collector's Initials: SC/DPA

Stream Width: 45 ft open water

Stream Depth: 0.2 - 0.5 ft

Cross Sectional Area: _____ ft ^{2}

Water Samples Collected For:	Yes/No	Comments
TCL VOCs	✓	
TCL Semi-VOCs	✓	
TAL Metals (dissolved)	✓	
TAL Metals (total)	✓	
TSS	✓	
TOC	✓	

Sample Collection Method: Grab also matrix spike matrix spike duplicate

Field Measurements:

TEMP	pH	COND	Eh	O_2	Color	Clarity	Odor
~10°	4.86	539	140 21 mm		lt. yellow	clear -	none
	~~4.86~~		98 @ 5 mm			easily	~~sediments~~
	~~Oct~~					stirred up	~~gas~~
in situ (16.0°)				6.32			

Additional Information:

Sheen on surface of water in areas of heavy growth (Typha)
Metallic droplets ~ ½" dia.

ROUX ASSOCIATES, INC.
PROJECT #06624Y, ISRT GSIP-2

Sampling Location: SW23

Sediment Samples Collected For:	Yes/No		Comments
TCL VOCs	✓		
TCL Semi-VOCs	✓		
TAL Metals, Tin	✓		
pH, Eh	✓		
Grain Size Analysis	✓		
TOC	✓		
Sulfide	✓		
Ammonia	✓		

Sample Collection Method: Ponar grab sampler Matrix Spike, MS Duplicate

Sediment Description:

brown/black silts with trace sand, twigs, high organic content, No smell

Additional Information:

SURFACE WATER SAMPLING

ROUX ASSOCIATES, INC.
PROJECT #06624Y, ISRT GSIP-2

Sampling Location: SW-24 Aberjona

Date: 10-2-91 Weather: Sunny 72°

Time: 3:30 (1530) Collector's Initials: DPA / SRC

Stream Width: 80 ft

Stream Depth: 0.5-1.0 ft

Cross Sectional Area: ~80 ft²

Broad wetland stream, phragmites along borders, duckweed floating in center, clumps of grasses.

Water Samples Collected For:	Yes/No	Comments
TCL VOCs	✓	
TCL Semi-VOCs	✓	
TAL Metals (dissolved)	✓	
TAL Metals (total)	✓	
TSS	✓	
TOC	✓	

Sample Collection Method: Grab

Field Measurements:

	TEMP	pH	COND	Eh	O_2	Color	Clarity	Odor
CRP	20°			133		Slightly yellow	clear	none
Oakton Pocket YSI in situ	5.07		376					
	(16.6°)				6.35			

Additional Information:

ROUX ASSOCIATES, INC.
PROJECT #06624Y, ISRT GSIP-2

Sampling Location: SW-24, SW corner of parking lot

Sediment Samples Collected For:	Yes/No		Comments
TCL VOCs	✓		
TCL Semi-VOCs	✓		
TAL Metals, Tin	✓		
pH, Eh	✓		
Grain Size Analysis	✓		
TOC	✓		
Sulfide	✓		
Ammonia	✓		

Sample Collection Method: PONAR GRAB SAMPLER

Sediment Description:

Brown/Black sandy silt, with high organic content.

Composite of 4 grab samples.

Sediment is producing high volume of gas

Additional Information:

APPENDIX B5

Surface-Water and Stream-Sediment
Chain of Custody Forms

1871

CHAIN OF CUSTODY

ROUX

Consulting Ground-Water Geologists & Engineers
ROUX ASSOCIATES INC

775 PARK AVENUE
SUITE 255
HUNTINGTON, NEW YORK 11743

Project Name: GSIP Phase 2

Project Number: 06624Y

Project Location: Industri-Plex Site, Woburn MA

Sampler(s): M. Smith, A. Farrell, C. Wu

ANALYSES

Page 1 of 1

	Sample Designation/Location	Date Collected	Time Collected	TCL Volatile Organic Compounds in 40 ml glass vial preserved with HCl, Chilled	TCL Volatile Organic Compounds in 40 ml glass vial Chilled Not Preserved	TAL Metals (dissolved) 1 liter poly bottle, Filtered, preserved with HNO3, Chilled				TOTAL BOTTLES	NOTES
(1)	OW-30A	12/16/91	1130	3		1					
(2)	OW-30B	12/16/91	1620	3		1					
(3)	OW-56A	12/16/91	1340	3		1					
(4)	OW-56B	12/16/91	1440		3	1					
(5)	OW-56C	12/16/91	1526		3	1					
(6)	OW-100	12/16/91			3	1					
(7)	T.B. NOT LISTED IN ORIGINAL COC										
						12/17/91					

Relinquished by:(Signature)	For	Date	Time	Received by:(Signature)	For	Date	Time
Martha M. Smith	ROUX	12-16-91	1900	[illegible]	Federal Express	12/17/91	9:50

Delivery Method: Fed Ex - Air Bill # 3753700775

Comments:

ROUX

CHAIN OF CUSTODY

Consulting Ground-Water Geologists & Engineers
ROUX ASSOCIATES INC
775 PARK AVENUE
SUITE 255
HUNTINGTON, NEW YORK 11743

ANALYSES — Page / of /

Project Name: GSIP Phase 2.
Project Number: 06624Y
Project Location: Industri Plex Site, Woburn, MA
Sampler(s): A. Farrell C. Wu

Analyses columns:
1. TCL volatile organic compounds in 40 ml glass vials, preserved with HCl, Chilled
2. TCL volatile organic compounds in 40 ml glass vial NO PRESERVATIVE, Chilled
3. TAL dissolved Metals in 1 liter poly bottle (filtered) preserved with HNO3, Chilled

Sample Designation/Location	Date Collected	Time Collected	TCL VOC (HCl, chilled)	TCL VOC (no preservative, chilled)	TAL dissolved metals (HNO3, chilled)				TOTAL BOTTLES	NOTES
OW-52A	12-17-91	1050	3		1				4	
OW-52B	12-17-91	1145		3	1				4	
OW-54A	12-17-91	1435	3		1		1		4	
OW-54B	12-17-91	1505		3	1				4	[illegible]
OW-54C	12-17-91	~~1030~~ 1545		3	1				4	
OW-52B MS	12-17-91	1145		3	1				4	Matrix Spike
OW-52B MSD	12-17-91	1145		3	1	Received	1 VIAL		4	Matrix Spike Dup
Field Blank #1	12-17-91	1110	3		1		Broken		4	
Trip Blank #2			3				12/18/91		3	

35 bottles total in cooler

Relinquished by:(Signature)	For	Date	Time	Received by:(Signature)	For	Date	Time
Martha M Smith	ROUX	12/17/91	1815				
				[illegible]	[illegible]	[illegible]	[illegible]

Delivery Method: Federal Express, Airbill # 3753700786

Comments: Matrix is ground-water.

#18528

#1881

ROUX

CHAIN OF CUSTODY

Consulting Ground-Water Geologists & Engineers
ROUX ASSOCIATES INC
775 PARK AVENUE
SUITE 255
HUNTINGTON, NEW YORK 11743

Page 1 of 1

Project Name: GSIP Phase 2
Project Number: 06624Y
Project Location: Industri-Plex Site Woburn, Mass
Sampler(s): A Farrell C. Wu

	Sample Designation/Location	Date Collected	Time Collected	TCL Volatile Organic Compound in 40ml glass vials Preserved w/ HCl; Chilled	TCL Volatile Organic Compound in 40ml glass vials No Preservative; Chilled	TAL dissolved metals in 1 Liter poly bottle, filtered, preserved w/ HNO3, Chilled				TOTAL BOTTLES	NOTES
1	OW-37	12/18/91	1115	3		1				4	
2	OW-55	12/18/91	1520		3	1				4	
3	OW 31	12/18/91	1240	3		1				4	
1	OW-37A	12/18/91	1030	3		1				4	
1MS	OW-37A MS	12/18/91	1030	3		1				4	Matrix Spike
1MSD	OW-37A MSD	12/18/91	1030	3		1				4	Matrix Spike Dup
5	Field ~~Sample~~ Blank #2	12/18/91	1505	3		1				4	
6	Trip Blank #3	12/18/91		3						3	

Total # bottles in Cooler: 31

Relinquished by:(Signature)	For	Date	Time	Received by:(Signature)	For	Date	Time
Ann Farrell	Roux	12/18/91	1700				
				K. Doyle	Ali Env. Lab	12/19/91	9:30

Delivery Method: FED EX AIR BILL # 3753700731

Comments: SAMPLE MATRIX IS GROUND WATER

#18820

ROUX

CHAIN OF CUSTODY

Consulting Ground-Water Geologists & Engineers
ROUX ASSOCIATES INC
775 PARK AVENUE
SUITE 255
HUNTINGTON, NEW YORK 11743

ANALYSES — Page 1 of 1

Project Name: GSIP (Phase) II
Project Number: 066024Y
Project Location: WOBURN, MA
Sampler(s): A. FARRELL, C. WU, J. MAKOWSKI

Sample Designation/Location	Date Collected	Time Collected	TCL Volatile Organic Compound in 40ml vials preserved w/ HCl; Chilled	TCL Volatile Organic Compound in 40ml vials; No preservative; Chilled	TAL Metals (Dissolved) in 1 liter poly bottles, filtered, preserved w/ HNO_3; Chilled				TOTAL BOTTLES	NOTES
WP-1	12/19/91	1155	3		1				4	
WP-3	12/19/91	1230	3		1				4	
WP-4	12/19/91	1445	~~3~~ AF	3	1				4	
WP-5	12/19/91	1000	3		1				4	
OW-101	12/19/91	1100	AF ~~[illegible]~~ 3		1				4	
TRIP BLANK #4	12/19/91		3						3	
										TOTAL BOTTLES PACKED: 23

Enxl #18820

Relinquished by: (Signature)	For	Date	Time	Received by: (Signature)	For	Date	Time
Ann Farrell	ROUX	12/19/91	1600				
				Susan [illegible]	ENSECO [illegible]	12/20	1045

Delivery Method: FEDERAL EXPRESS 3753700742

Comments: MATRIX IS GROUNDWATER

APPENDIX B6

Halls Brook Holding Area and
Metals Mobility
Chain of Custody Forms

pace INCORPORATED THE ASSURANCE OF QUALITY

Columbia Analytical

10362

CHAIN-OF-CUSTODY RECORD
Analytical Request

Client: PTI Env. Svcs.
Address: 2995 Baseline Rd, Ste. 202
Boulder, CO 80303
Phone: 303-444-7270

Report To: J. Houston Kempton
Bill To: PTI
P.O. # / Billing Reference: C1320301
Project Name / No.: C1320301 Metals Mobility

Pace Client No.:
Pace Project Manager:
Pace Project No.:
*Requested Due Date:

Sampled By (PRINT): Connie Travers/Chris Sellstone
Sampler Signature
Date Sampled: 11/18/91 - 11/19/91

ITEM NO.	SAMPLE DESCRIPTION		TIME	MATRIX	PACE NO.	NO. OF CONTAINERS	PRESERVATIVES: UNPRESERVED	H_2SO_4	HNO	VOA/HCl	ANALYSES REQUEST: BTEX	REMARKS
1	OW-1A	32202 11/18/91	17:15	W		1				X	X	
2	OW-1A	32201 11/18/91	17:15	W		1				X	X	
3	OW-15	32237 11/19/91	15:00	W		1				X	X	
4	OW-15	32238 11/19/91	15:00	W		1				X	X	
5	OW-33A	32286 11/19/91	16:30	W		1				X	X	
6	OW-33A	32285 11/19/91	16:30	W		1				X	X	
7	EQ-1-45	32986 11/19/91	11:12	W		1				X	X	
8												

COOLER NOS.	BAILERS	SHIPMENT METHOD OUT / DATE	SHIPMENT METHOD RETURNED / DATE	ITEM NUMBER	RELINQUISHED BY / AFFILIATION	ACCEPTED BY / AFFILIATION	DATE	TIME

Additional Comments

LISTED ON 2 SEPARATE COCS

SEE REVERSE SIDE FOR INSTRUCTIONS

3/10

pace
INCORPORATED
THE ASSURANCE OF QUALITY

10363

CHAIN-OF-CUSTODY RECORD
Analytical Request

Client

Address

Phone

Report To:

Bill To:

P.O. # / Billing Reference C1320401

Project Name / No. 1320401 / HBHA

Pace Client No.

Pace Project Manager

Pace Project No.

*Requested Due Date

Sampled By (PRINT): Thomas Doyle/Andy Davis

Sampler Signature

Date Sampled 11/19/98

ITEM NO.	SAMPLE DESCRIPTION	TIME	MATRIX	PACE NO.	NO. OF CONTAINERS	PRESERVATIVES: UNPRESERVED	H_2SO_4	HNO	VOA	ANALYSES REQUEST: BTEX	REMARKS
1	SC21B 33427		S		1	X				X	
2	SC23B 33428				1	X				X	
3	SC26B 33424				1	X				X	
4	SC29B 33430				1	X				X	
5	SC213B 33431				1	X				X	
6											
7											
8											

COOLER NOS.	BAILERS	SHIPMENT METHOD OUT / DATE	SHIPMENT METHOD RETURNED / DATE	ITEM NUMBER	RELINQUISHED BY / AFFILIATION	ACCEPTED BY / AFFILIATION	DATE	TIME

Additional Comments

SEE REVERSE SIDE FOR INSTRUCTIONS

pace
INCORPORATED
THE ASSURANCE OF QUALITY

10364

CHAIN-OF-CUSTODY RECORD
Analytical Request

Client

Address

Phone

Report To:

Bill To:

P.O. # / Billing Reference

Project Name / No

Pace Client No.

Pace Project Manager

Pace Project No.

*Requested Due Date:

Sampled By (PRINT): Thomas Doyle

Sampler Signature

11/19/91
Date Sampled

ITEM NO.	SAMPLE DESCRIPTION	TIME	MATRIX	PACE NO.	NO. OF CONTAINERS	PRESERVATIVES: UNPRESERVED	H_2SO_4	HNO_3	VOA			ANALYSES REQUEST	REMARKS
1	SC 1 1	740	S		1	Y						BTEX	
2	SC 1 3	742	S		1	Y							
3	SC 1 6	740	S		1	Y							
4	SC 1 7	745	S		1	Y							
5	SC 1 12	745	S		1	Y							
6													
7													
8													

COOLER NOS.	BAILERS	SHIPMENT METHOD OUT / DATE	SHIPMENT METHOD RETURNED / DATE	ITEM NUMBER	RELINQUISHED BY / AFFILIATION	ACCEPTED BY / AFFILIATION	DATE	TIME

Additional Comments

soil
0/5

SEE REVERSE SIDE FOR INSTRUCTIONS

PTI
ENVIRONMENTAL SERVICES
15375 SE 30th Place Suite 250
Bellevue Washington 98007
206 643-9803
FAX (206) 643 9827

4000 Kruse Way Place
Building One Suite 220
Lake Oswego Oregon 97035
503 636-4338
FAX (503) 636-4315

DOCUMENT NO.

CHAIN OF CUSTODY RECORD

PROJECT				SAMPLERS: (Signature)							
SAMPLE NO.	SITE	DATE	TIME	SAMPLE MATRIX						NUMBER OF CONTAINERS	REMARKS
				WATER	SEDIMENT	TISSUE	AIR	OIL	OTHER		TAG NO.
SC-1-14					/						
SC-1-7			170								
SC-1-10											
SC-1-2											
SC-1-6			17:59		/						
SC-2-1					/						
SC-2-5											
SC-2-11					/						
SC-2-3											
SC-2-7											
SC-3-2											
SC-3-9											
SC-3-8											
SC-3-6											
SC-3-10											
BW-1											
BW-1											

RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
RELINQUISHED BY: (Signature)	REC'D. BY MOBILE LAB FOR FIELD ANALYSIS: (Signature)	DATE/TIME
DISPATCHED BY: (Signature) DATE/TIME	RECEIVED FOR LAB BY: (Signature)	DATE/TIME
METHOD OF SHIPMENT:		

Distribution: Original & One Copy - Accompany Shipment
One Copy - Survey Coordinator Field Files

SOIL WAT SOIL
TN n/a n/a Cr n/a AsCrPb n/a

PTI
ENVIRONMENTAL SERVICES
15375 SE 30th Place, Suite 250
Bellevue, Washington 98007
(206) 643-9803
FAX (206) 643-9827

4000 Kruse Way Place
Building One, Suite 220
Lake Oswego, Oregon 97035
(503) 636-4338
FAX (503) 636-4315

DOCUMENT NO.

CHAIN OF CUSTODY RECORD

PROJECT				SAMPLERS: (Signature)							
SAMPLE NO.	SITE	DATE	TIME	SAMPLE MATRIX						NUMBER OF CONTAINERS	REMARKS
				WATER	SEDIMENT	TISSUE	AIR	OIL	OTHER		TAG NO.
EQ-1A-34											
EQ-1A-34											
EQ-1A-19											
EQ-1A-19											
EQ-1A-23											
EQ-1A-23											
OW 47											
OW 47											
OW-12											
OW-12											

RELINQUISHED BY: (Signature)	**RECEIVED BY:** (Signature)	**DATE/TIME**
RELINQUISHED BY: (Signature)	**RECEIVED BY:** (Signature)	**DATE/TIME**
RELINQUISHED BY: (Signature)	**REC'D. BY MOBILE LAB FOR FIELD ANALYSIS:** (Signature)	**DATE/TIME**

DISPATCHED BY: (Signature)	**DATE/TIME**	**RECEIVED FOR LAB BY:** (Signature)	**DATE/TIME**

METHOD OF SHIPMENT:

Distribution: Original & One Copy – Accompany Shipment
One Copy – Survey Coordinator Field Files

PTI
ENVIRONMENTAL SERVICES
15375 SE 30th Place, Suite 250
Bellevue, Washington 98007
(206) 643-9803
FAX (206) 643-9827

4000 Kruse Way Place
Building One, Suite 220
Lake Oswego, Oregon 97035
(503) 636-4338
FAX (503) 636-4315

DOCUMENT NO. 1739

CHAIN OF CUSTODY RECORD

PROJECT	SAMPLERS: (Signature)

SAMPLE NO.	SITE	DATE	TIME	SAMPLE MATRIX						NUMBER OF CONTAINERS	REMARKS
				WATER	SEDIMENT	TISSUE	AIR	OIL	OTHER		TAG NO.
OW-17				X							
OW-17				X							
OW-17b				X							
OW-17b				X							
OW-19A				X							
OW-19A				X							
EQ2A				X							
EQ2A				X							
EQ2A				X							
EQ2A				X							
EQ2A16				X							
EQ2A16				X							
EQ2A24											
EQ2A24											
EQ2A29											
EQ2A29											
EQ2A33											
EQ2A33				X							
EQ2A44				X							
EQ745				X							

RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
RELINQUISHED BY: (Signature)	REC'D. BY MOBILE LAB FOR FIELD ANALYSIS: (Signature)	DATE/TIME
DISPATCHED BY: (Signature) DATE/TIME	RECEIVED FOR LAB BY: (Signature)	DATE/TIME

METHOD OF SHIPMENT: FEDERAL EXPRESS

Distribution: Original & One Copy – Accompany Shipment
One Copy – Survey Coordinator Field Files

3/7

PTI
ENVIRONMENTAL SERVICES
15375 SE 30th Place, Suite 250
Bellevue, Washington 98007
(206) 643-9803
FAX (206) 643-9827

4000 Kruse Way Place
Building One, Suite 220
Lake Oswego, Oregon 97035
(503) 636-4338
FAX (503) 636-4315

DOCUMENT NO.

CHAIN OF CUSTODY RECORD
ANALYTICAL REQUEST

PROJECT				SAMPLERS: (Signature)							
SAMPLE NO.	SITE	DATE	TIME	SAMPLE MATRIX						NUMBER OF CONTAINERS	REMARKS
				WATER	SEDIMENT	TISSUE	AIR	OIL	OTHER		ANALYSIS TAG NO.
OW-42		11/20/91	16:30	X						1	BTEX
OW-42		11/20/91	16:30	X						1	BTEX
SC3-1		11/20/91	17:30		X					1	BTEX
SC3-2		11/20/91	17:30		X					1	BTEX
SC3-4		11/20/91	17:30		X					1	BTEX
SC3-6		11/20/91	17:30		X					1	BTEX
SC3-9		11/20/91	17:30		X					1	BTEX
EQ-7-45	32980	11/20/91	19:12	X						1	BTEX

RELINQUISHED BY: (Signature)	**RECEIVED BY:** (Signature)	**DATE/TIME**
RELINQUISHED BY: (Signature)	**RECEIVED BY:** (Signature)	**DATE/TIME**
RELINQUISHED BY: (Signature)	**REC'D. BY MOBILE LAB FOR FIELD ANALYSIS:** (Signature)	**DATE/TIME**
DISPATCHED BY: (Signature) **DATE/TIME**	**RECEIVED FOR LAB BY:** (Signature)	**DATE/TIME**
METHOD OF SHIPMENT:		

Distribution: Original & One Copy – Accompany Shipment
One Copy – Survey Coordinator Field Files

SOIL

1/1 of 5

PTI
ENVIRONMENTAL SERVICES
15375 SE 30th Place Suite 250
Bellevue, Washington 98007
(206) 643-9803
FAX (206) 643-9827

4000 Kruse Way Place
Building One, Suite 220
Lake Oswego, Oregon 97035
(503) 636-4338
FAX (503) 636-4315

DOCUMENT NO. 772

CHAIN OF CUSTODY RECORD

PROJECT				**SAMPLERS:** (Signature)								
SAMPLE NO.	**SITE**	**DATE**	**TIME**	**SAMPLE MATRIX**						**NUMBER OF CONTAINERS**	**REMARKS**	
				WATER	SEDIMENT	TISSUE	AIR	OIL	OTHER			
EQ-3A-5				X						1	TAG NO. X	PP&T HCC
EQ-3A-5				X						1	X	HCC
EQ-3A-16				X						1	X	HCC
EQ-3A-16				X						1	X	HCC
EQ-3A-42				X						1	X	HCC
EQ-3A-42				X						1	X	HCC
EQ-3A-8				X						1		HCC
EQ-3A-8				X						1		HCC
EQ-3A-24				X						1		HCC
EQ-3A-24				X						1		HCC
EQ-3A-33				X						1		HCC
EQ-3A-33				X						1		HCC
OW-41										1		HCC
OW-41				X						1		HCC
EQ 1A 46				X						1		HCC
EQ 1A 46				X						1		HCC
EQ-1A-4				X						1		HCC
EQ-1A-4				X						1		HCC
EQ-1A-43				X						1		HCC
EQ-1A-43				X						1		HCC

RELINQUISHED BY: (Signature)	**RECEIVED BY:** (Signature)	**DATE/TIME**
	(FED EX)	
RELINQUISHED BY: (Signature)	**RECEIVED BY:** (Signature)	**DATE/TIME**
RELINQUISHED BY: (Signature)	**REC'D. BY MOBILE LAB FOR FIELD ANALYSIS:** (Signature)	**DATE/TIME**

DISPATCHED BY: (Signature)	**DATE/TIME**	**RECEIVED FOR LAB BY:** (Signature)	**DATE/TIME**

METHOD OF SHIPMENT:

Distribution: Original & One Copy – Accompany Shipment
One Copy – Survey Coordinator Field Files

1/91

PTI
ENVIRONMENTAL SERVICES
15375 SE 30th Place, Suite 250
Bellevue, Washington 98007
(206) 643-9803
FAX (206) 643-9827

4000 Kruse Way Place
Building One, Suite 220
Lake Oswego, Oregon 97035
(503) 636-4338
FAX (503) 636-4315

PTI ENVIRONMENTAL SERVICES
2995 BASELINE RD, SUITE 202
BOULDER, CO 80303
(303) 444-7270

REPORT TO: J. HOUSTON KEMPER

DOCUMENT NO. 1778

BILLING REFERENCE:
C132-0301 Metals Mob
C132-0401 HBHA

CHAIN OF CUSTODY RECORD & ANALYTICAL REQUEST

PROJECT C132-0301 Metals Mobility Woburn C132-0401 HBHA

SAMPLERS: (Signature) 11/24/91 Cynthia Travers

SAMPLE NO.	~~SAMPLE~~ TAG NUMBER	DATE	TIME	SAMPLE MATRIX: WATER	SEDIMENT	TISSUE	AIR	OIL	OTHER	NUMBER OF CONTAINERS	REMARKS: ANALYSIS TAG NO.	FEES
OW-101	32568	11/22/91	11:00	X						1	BTEX	—
OW-101	32569	11/22/91	11:00	X						1	BTEX	—
OW-43	10193	11/23/91	17:00	X						1	"	—
OW-43	10194	11/23/91	17:00	X						1	"	—
OW-16	32249	11/22/91	10:00	X						1	"	—
OW-16	32250	11/22/91	10:00	X						1	"	—
OW-37	24274	11/23/91	14:00	X						1	"	—
OW-37	24275	11/23/91	~~14:00~~	11:45 X						1	"	—
OW-31	24239	11/23/91	~~14:00~~	11:45 X						1	"	—
OW-31	24238	11/23/91	14:00	X						1	"	—
OW-32	24250	11/23/91	15:30	X						1	"	—
OW-32	24251	11/23/91	15:30	X						1	"	—
OW-36	24263	11/23/91	10:45	X						1	"	—
OW-36	24262	11/23/91	10:45	X						1	"	—
OW-48A	24213	11/22/91	16:45	X						1	"	—
OW-48A	24214	11/22/91	16:45	X						1	"	—
OW-11	24201	11/22/91	15:00	X						1	"	—
OW-11	24202	11/22/91	15:00	X						1	"	—
OW-38	24286	11/22/91	8:45	X						1	"	—
OW-38	24287	11/22/91	8:45	X						1	"	—

RELINQUISHED BY: (Signature) Cynthia Travers 11/24/91	**RECEIVED BY:** (Signature)	**DATE/TIME**
RELINQUISHED BY: (Signature)	**RECEIVED BY:** (Signature)	**DATE/TIME**
RELINQUISHED BY: (Signature)	**REC'D. BY MOBILE LAB FOR FIELD ANALYSIS:** (Signature)	**DATE/TIME**
DISPATCHED BY: (Signature) **DATE/TIME**	**RECEIVED FOR LAB BY:** (Signature)	**DATE/TIME**

METHOD OF SHIPMENT: FEDERAL EXPRESS

Distribution: Original & One Copy – Accompany Shipment
One Copy – Survey Coordinator Field Files

10
~~20~~/10

4L

Chain of Custody Record

TMA
Thermo Analytical Inc.
K6917

Skinner And Sherman Laboratories
300 Second Avenue
Post Office Box 521
Waltham, MA 02254-0521
(617) 890-7200

DATE 11/24/91 PAGE 1 OF 6

CLIENT PTI ENV. SERVICES
ADDRESS 2795 BASELINE Rd, SUITE 202
BOULDER, CO 80303
ATT: ANDY DAVIS
PROJECT NO. C132030/
PROJECT NAME WOBER
SAMPLERS (SIGNATURE)

SAMPLE NO.	DATE	TIME	COMP.	GRAB	TAG # LOCATION	Parameters: CT (TDML)	Iced	Filtered	Preservative	Sample Type	NUMBER OF CONTAINERS	Observations/ Comments
~~EQ-3A-26~~	~~11/21/91~~	~~11:50~~			~~32554~~							
EQ-3A-26	11/21/91	11:50			32554	X				AQ		
EQ-3A-13	11/21/91	11:50			32553	X				"		
OW-19A	11/24/91	12:20			32281	X				"		
OW-37	11/23/91	11:45			32258	X				"		
OW-42	11/24/91	16:30			25999	X				"		
OW-17	11/20/91	14:33			32269	X				"		
OW-36	11/23/91	10:45			32292	X				"		
OW-17b	11/20/91	15:00			23299	X				"		
OW-32	11/23/91	15:30			24259	X				"		
OW-31	11/23/91	14:00			24298	X				"		
OW-43	11/23/91	17:00			32246	X				"		
OW-11	11/22/91	20:00			32586	X				"		

RELINQUISHED BY	DATE	RECEIVED BY	DATE	RELINQUISHED BY	DATE	RECEIVED BY	DATE
Signature: Houston Kemp	11/24/91	Signature		Signature		Signature	
Printed Name: PTI	TIME 1550	Printed Name	TIME	Printed Name	TIME	Printed Name	TIME
Company: ~~PTI~~ FED-EX		Company		Company		Company	
RELINQUISHED BY	DATE	RECEIVED BY	DATE	RELINQUISHED BY	DATE	RECEIVED BY (Laboratory)	DATE 11/26
Signature		Signature		Signature		Signature: Lori K. Hamm	
Printed Name	TIME	Printed Name	TIME	Printed Name	TIME	Printed Name: LKS	TIME 9:10
Company		Company		Company		Skinner & Sherman Labs	

TOTAL NUMBER OF CONTAINERS

METHOD OF SHIPMENT

SPECIAL SHIPMENT/HANDLING OR STORAGE REQUIREMENTS

Chain of Custody Record

TMA
Thermo Analytical Inc.

~~Skinner And Sherman Laboratories~~
~~900 Second Avenue~~
~~Post Office Box 521~~
~~Waltham, MA 02254-0521~~
~~(617) 890-7200~~

DATE 11/24/91 PAGE 2 OF 6

CLIENT PTI ENV. SERVICES
ADDRESS 2995 BASELINE Rd, SUITE 202
BOULDER, CO 80303
PROJECT NO. C1320301
PROJECT NAME WOBURN
SAMPLERS (SIGNATURE)

SAMPLE NO.	DATE	TIME	COMP.	GRAB	TAG. # ~~LOCATION~~	Parameters: TOTAL CHROMIUM	Other: Iced	Filtered	Preservative	Sample Type	NUMBER OF CONTAINERS	Observations/ Comments
~~OW-48A~~	~~11/23/91~~	~~20:00~~										
OW-48A	11/22/91	20:00			32585	X				AQUEOUS		
OW-16	11/23/91	10:00			32257	X				"		
OW-38	11/22/91	8:45			24294	X				"		
EQ-1A-20	11/19/91	13:15			33406	X				"		
OW-1A	11/19/91	17:20			32209	X				"		
EQ-2A-26	11/20/91	11:14			32993	X				"		
EQ-2A-13	11/20/91	11:30			32995	X				"		
OW-33A	11/19/91	16:30			32293	X				"		
OW-15	11/19/91	15:05			32245	X				"		
OW-47	11/21/91	17:00			33455	X				"		
OW-12	11/21/91	14:37			32233	X				"		
OW-101	11/23/91	11:00			32565	X				"		

RELINQUISHED BY	DATE	RECEIVED BY	DATE	RELINQUISHED BY	DATE	RECEIVED BY	DATE
Signature: Houston Kempton	11/24/91	Signature		Signature		Signature	
Printed Name: HOUSTON KEMPTON	TIME 15:00	Printed Name	TIME	Printed Name	TIME	Printed Name	TIME
Company: PTI		Company		Company		Company	
RELINQUISHED BY	DATE	RECEIVED BY	DATE	RELINQUISHED BY	DATE	RECEIVED BY (Laboratory)	DATE
Signature		Signature		Signature		Signature	
Printed Name	TIME	Printed Name	TIME	Printed Name	TIME	Printed Name: Skinner & Sherman Labs	TIME
Company		Company		Company			

TOTAL NUMBER OF CONTAINERS

METHOD OF SHIPMENT

SPECIAL SHIPMENT/HANDLING OR STORAGE REQUIREMENTS

TAL 1010 | Analyst | Control

Chain of Custody Record

TMA
Thermo Analytical Inc.

Skinner And Sherman Laboratories
300 Second Avenue
Post Office Box 521
Waltham, MA 02254-0521
(617) 890-7200

DATE 11/24/91 PAGE 3 OF ____

CLIENT PTI ENV. SERVICES
ADDRESS 2955 BASELINE Rd, SUITE 202
BOULDER, CO 80303
PROJECT NO. C132030/
PROJECT NAME WOBURN
SAMPLERS (SIGNATURE)

SAMPLE NO.	DATE	TIME	COMP.	GRAB	TAG # LOCATION	Parameters: TOTAL CF	Parameters: TAL METALS	Other: Iced	Other: Filtered	Other: Preservative	Sample Type	NUMBER OF CONTAINERS	Observations/ Comments
OW-41	11/21/91	15:15			25982	X					AQUEOUS		
EQ-1A-38	11/19/91	13:15			33405	X					"		
OW-48A	11/22/91	16:45			25523	X					"		
OW-103	11/22/91	12:30			32589	X					"		
OW-48A	11/22/91	16:45			25523	X					"		
SM-1	11/23/91	20:00			32588	X					"		
DUP SM-4	11/23/91	20:00			32587	X					"		
EQ-3A-3536	11/21/91	12:35			33453	X	X				"		
EQ-38-10-14	11/21/91	11:55			32556	X	X				"		
EQ-3A-1254	11/21/91	12:20			33448	X	X				"		
EQ-3A-2223	11/21/91	12:30			33451	X	X				"		
EQ-3A-4344	11/21/91	12:45			33454	X	X				"		

RELINQUISHED BY	DATE	RECEIVED BY	DATE	RELINQUISHED BY	DATE	RECEIVED BY	DATE
Signature		Signature		Signature		Signature	
Printed Name	TIME	Printed Name	TIME	Printed Name	TIME	Printed Name	TIME
Company		Company		Company		Company	
RELINQUISHED BY	DATE	RECEIVED BY	DATE	RELINQUISHED BY	DATE	RECEIVED BY (Laboratory)	DATE
Signature		Signature		Signature		Signature	
Printed Name	TIME	Printed Name	TIME	Printed Name	TIME	Printed Name: Skinner & Sherman Labs	TIME
Company		Company		Company			

TOTAL NUMBER OF CONTAINERS

METHOD OF SHIPMENT

SPECIAL SHIPMENT/HANDLING OR STORAGE REQUIREMENTS

Chain of Custody Record

TMA
Thermo Analytical Inc.

Skinner And Sherman Laboratories
300 Second Avenue
Post Office Box 521
Waltham, MA 02254-0521
(617) 890-7200

DATE 11/24/91 PAGE 4 OF ____

CLIENT PTI ENV. SERVICES
ADDRESS 2995 BASELINE RD SUITE 202
BOULDER CO 80303
ATT: ANDY DAVIS
PROJECT NO. C13203.01
PROJECT NAME LOWBURY
SAMPLERS (SIGNATURE)

SAMPLE NO.	DATE	TIME	COMP.	GRAB	TAC # LOCATION	TAL # STAMPS	Iced	Filtered	Preservative	Sample Type	NUMBER OF CONTAINERS	Observations/ Comments
						Parameters				Other		
EQ-3A-2930	11/21/91	12:35			33452	K				AA		
EQ-3A-1415	11/21/91	12:26			33450	K				"		
EQ-3A-510	11/21/91	12:23			33449	K				"		
EQ-2B-1112 1314	11/20/91	12:10			32956	K				"		
EQ-2A-2223	11/20/91	10:49			32502	K				"		
EQ-2A-3435	11/20/91	11:02			32504	K				"		
EQ-2A-12	11/20/91	10:42			32501	K				"		
EQ-2A-4243	11/20/91	11:10			32505	K				"		
OW-42	11/20/91	16:30			25955	K				"		
OW-47	11/21/91	17:00			32217	K				"		
OW-33A	11/19/91	16:30			32289	K				"		
OW-17b	11/20/91	14:45			24229	K				"		

RELINQUISHED BY	DATE	RECEIVED BY	DATE	RELINQUISHED BY	DATE	RECEIVED BY	DATE
Signature		Signature		Signature		Signature	
Printed Name	TIME	Printed Name	TIME	Printed Name	TIME	Printed Name	TIME
Company		Company		Company		Company	
RELINQUISHED BY	DATE	RECEIVED BY	DATE	RELINQUISHED BY	DATE	RECEIVED BY (Laboratory)	DATE
Signature		Signature		Signature		Signature	
Printed Name	TIME	Printed Name	TIME	Printed Name	TIME	Printed Name Skinner & Sherman Labs	TIME
Company		Company		Company			

TOTAL NUMBER OF CONTAINERS

METHOD OF SHIPMENT

SPECIAL SHIPMENT/HANDLING OR STORAGE REQUIREMENTS

Chain of Custody Record

TMA
Thermo Analytical Inc.

Skinner And Sherman Laboratories
300 Second Avenue
Post Office Box 521
Waltham, MA 02254-0521
(617) 890-7200

DATE 11/24/91 PAGE 5 OF _____

CLIENT PTI
ADDRESS 2995 BASELINE, SUITE 202
BOULDER CO 80303
ATT: ANDY DAVIS
PROJECT NO. C1320301
PROJECT NAME WOBURN
SAMPLERS (SIGNATURE)

SAMPLE NO.	DATE	TIME	COMP	GRAB	MAC # ~~LOCATION~~	Parameters: TAL metals	Parameters: As, Cr, Pb	Other: Iced	Other: Filtered	Other: Preservative	Sample Type	NUMBER OF CONTAINERS	Observations/ Comments
OW-1A	11/18/91	16:50			32205	X					AQ.		
OW-17	11/20/91	14:20			32265	X					"		
EQ2A-14,15	11/20/91	10:37			32952	X					"		
OW-12	11/21/91	12:05			32229	X					"		
OW-19A	11/20/91	2:15			32277	X					"		
EQ-2A-30,29	11/20/91	10:59			32503	X					"		
OW-4	11/21/91	15:00			25993	X					"		
EQ-2A-9,10	11/20/91	10:30			32991	X					"		
EQ-1A-13,14	11/19/91	11:45			33301	X					"		
OW-15	11/19/91	14:51			32241	X					"		
EQ-1A-3233	11/19/91	13:00			33402 ✓		X				"		
EQ-1A-1819	11/19/91	11:45			33302 ✓		X				"		

RELINQUISHED BY	DATE	RECEIVED BY	DATE	RELINQUISHED BY	DATE	RECEIVED BY	DATE
Signature		Signature		Signature		Signature	
Printed Name	TIME	Printed Name	TIME	Printed Name	TIME	Printed Name	TIME
Company		Company		Company		Company	
RELINQUISHED BY	DATE	RECEIVED BY	DATE	RELINQUISHED BY	DATE	RECEIVED BY (Laboratory)	DATE
Signature		Signature		Signature		Signature	
Printed Name	TIME	Printed Name	TIME	Printed Name	TIME	Printed Name: Skinner & Sherman Labs	TIME
Company		Company		Company			

TOTAL NUMBER OF CONTAINERS

METHOD OF SHIPMENT

SPECIAL SHIPMENT/HANDLING OR STORAGE REQUIREMENTS

TMA
Thermo Analytical Inc.

Skinner And Sherman Laboratories
300 Second Avenue
Post Office Box 521
Waltham, MA 02254-0521
(617) 890-7200

Chain of Custody Record

DATE 11/24/91 PAGE 6 OF ____

CLIENT PTI
ADDRESS 2995 BASELINE Rd, SUITE 202
Boulder CO 80303
ATTN ANDY DAUL
PROJECT NO ~~C0002~~ C132030/
PROJECT NAME WOBURN
SAMPLERS (SIGNATURE)

SAMPLE NO.	DATE	TIME	COMP.	GRAB	TAC # LOCATION	Parameters: As, Cr, Pb	Other: Iced	Filtered	Preservative	Sample Type	NUMBER OF CONTAINERS	Observations/ Comments
~~EQ-1A-4442~~	~~11/19/91~~	~~13:00~~			~~33301~~							
EQ-1A-4442	11/19/91	13:00			33401	X				AQ		
EQ1A-2122	11/19/91	11:50			33303	X				4		
EQ1A 67	11/19/91	11:40			33300	X				"		
EQ-1A-2627	11/19/91	13:00			33402	X				"		

RELINQUISHED BY	DATE	RECEIVED BY	DATE	RELINQUISHED BY	DATE	RECEIVED BY	DATE
Signature		Signature		Signature		Signature	
Printed Name	TIME	Printed Name	TIME	Printed Name	TIME	Printed Name	TIME
Company		Company		Company		Company	
RELINQUISHED BY	DATE	RECEIVED BY	DATE	RELINQUISHED BY	DATE	RECEIVED BY (Laboratory)	DATE
Signature		Signature		Signature		Signature	
Printed Name	TIME	Printed Name	TIME	Printed Name	TIME	Printed Name	TIME
Company		Company		Company		Skinner & Sherman Labs	

TOTAL NUMBER OF CONTAINERS

METHOD OF SHIPMENT

SPECIAL SHIPMENT/HANDLING OR STORAGE REQUIREMENTS

PTI
ENVIRONMENTAL SERVICES
15375 SE 30th Place, Suite 250
Bellevue, Washington 98007
(206) 643-9803
FAX (206) 643-9827

4000 Kruse Way Place
Building One, Suite 220
Lake Oswego, Oregon 97035
(503) 636-4338
FAX (503) 636-4315

PTI ENVIRONMENTAL SERVICES
2995 BASELINE RD, SUITE 202
BOULDER, CO 80303
(303) 444-7270

REPORT TO: J. HOUSTON KEMPTON

DOCUMENT NO. 1777

BILLING REFERENCE:
C132-0301 Metals Mobility
C132-0401 HBHA

CHAIN OF CUSTODY RECORD & ANALYTICAL REQUEST

PROJECT C132-0301 ; C132-0401

SAMPLERS: (Signature) 11/23/91 Carter Traver

	SAMPLE NO.	~~SITE~~ TAG NUMBER	DATE	TIME	SAMPLE MATRIX: WATER	SEDIMENT	TISSUE	AIR	OIL	OTHER	NUMBER OF CONTAINERS	REMARKS - All Samples analyzed for Methylated As Analysis: TAG NO.	PRES.
1PII#1	OW-1A	32211	11/18/91	16:48	X						1	Methylated As	NONE
2	OW-15	32247	11/19/91	14:45	X						1	"	"
3	OW-17b	24299	11/20/91	14:15	X						1	"	"
4	OW-42	32298	11/20/91	16:30	X						1	"	"
5	OW-33A	32295	11/19/91	16:30	X						1	"	"
6	OW-38	24296	11/22/91	8:45	X						1	"	"
7	OW-101	32561	11/22/91	11:00	X						1	"	"
8	OW-47	32223	11/21/91	17:00	X						1	"	"
9	OW-41	25989	11/21/91	14:50	X						1	"	"
10	OW-17	32271	11/20/91	14:00	X						1	"	"
11	OW-12	32235	11/21/91	12:00	X						1	"	"
12	OW-19A	32283	11/20/91	12:05	X						1	"	"
13	OW-16	32259	11/22/91	10:00	X						1	"	"
14	OW-32	33374	11/23/91	15:30	X						1	"	"
	OW-32	33375	11/23/91	15:30	X						1	"	"
	OW-32	33376	11/23/91	15:30	X						1	"	"
15	OW-11	32576	11/22/91	15:00	X						1	"	"
	OW-11	32577	11/22/91	15:00	X						1	"	"
	OW-11	32578	11/22/91	15:00	X						1	"	"
16	EQ[illegible]	[illegible]	11/19/91	14:00	X						1	"	"

RELINQUISHED BY: (Signature) Carter Traver 11/23/91	**RECEIVED BY:** (Signature)	**DATE/TIME** 11/25/91 2:00
RELINQUISHED BY: (Signature)	**RECEIVED BY:** (Signature)	**DATE/TIME**
RELINQUISHED BY: (Signature)	**REC'D. BY MOBILE LAB FOR FIELD ANALYSIS:** (Signature)	**DATE/TIME**
DISPATCHED BY: (Signature) **DATE/TIME**	**RECEIVED FOR LAB BY:** (Signature)	**DATE/TIME**

METHOD OF SHIPMENT: FEDERAL EXPRESS

Distribution: Original & One Copy - Accompany Shipment
One Copy - Survey Coordinator Field Files

PTI
ENVIRONMENTAL SERVICES
15375 SE 30th Place, Suite 250
Bellevue, Washington 98007
(206) 643-9803
FAX (206) 643-9827

4000 Kruse Way Place
Building One, Suite 220
Lake Oswego, Oregon 97035
(503) 636-4338
FAX (503) 636-4315

PTI ENVIRONMENTAL SERVICES
2995 BASELINE RD, SUITE 202
BOULDER, CO 80303
(303) 444 7270

REPORT TO: J. HOUSTON KEMPTON

DOCUMENT NO. 1759

Billing Reference:
C132-0301 Metals Mobility
C132-0401 HBHA

CHAIN OF CUSTODY RECORD & ANALYTICAL REQUEST

PROJECT C132-0301 ; C132-0401

SAMPLERS: (Signature) Carolyn Travers 11/23/91

SAMPLE NO.	~~SITE~~ TAG NUMBER	DATE	TIME	SAMPLE MATRIX: WATER	SEDIMENT	TISSUE	AIR	OIL	OTHER	NUMBER OF CONTAINERS	REMARKS: All samples to be analyzed for methylated Arsenic. ANALYSIS TAG NO.	PRES.
OW-37	33386	11/23/91	11:45	X						1	Methylated As	None
-17 OW-37	33387	11/23/91	11:45	X						1	"	"
OW-37	33388	11/23/91	11:45	X						1	"	"
OW-36	33380	11/23/91	10:45	X						1	"	"
-18 OW-36	33381	11/23/91	10:45	X						1	"	"
OW-36	33382	11/23/91	10:45	X						1	"	"
OW-31	33368	11/23/91	14:00	X						1	"	"
19 OW-31	33369	11/23/91	14:00	X						1	"	"
OW-31	33370	11/23/91	14:00	X						1	"	"
OW-43	32582	11/23/91	17:00	X						1	"	"
20 OW-43	32583	11/23/91	17:00	X						1	"	"
OW-43	32584	11/23/91	17:00	X						1	"	"
OW-48A	33363	11/22/91	16:45	X						1	"	"
21 OW-48A	33364	11/22/91	16:45	X						1	"	"
OW-48A	33365	11/22/91	16:45	X						1	"	"
22 EQ-3B-23,24	32545	11/21/91	11:07	X						1	"	"
EQ-3B-23,24	32544	11/21/91	11:07	X						1	"	"
EQ-3B-3,4	32559	11/21/91	13:01	X						1	"	"
23 EQ-3B-3,4	32558	11/21/91	13:01	X						1	"	"
				X						1	"	"

RELINQUISHED BY: (Signature) Carolyn Travers 11/23/91	**RECEIVED BY:** (Signature)	**DATE/TIME** 11/25/91 2:00
RELINQUISHED BY: (Signature)	**RECEIVED BY:** (Signature)	**DATE/TIME**
RELINQUISHED BY: (Signature)	**REC'D. BY MOBILE LAB FOR FIELD ANALYSIS:** (Signature)	**DATE/TIME**
DISPATCHED BY: (Signature) **DATE/TIME**	**RECEIVED FOR LAB BY:** (Signature)	**DATE/TIME**
METHOD OF SHIPMENT:		

Distribution: Original & One Copy – Accompany Shipment
One Copy – Survey Coordinator Field Files

PTI
ENVIRONMENTAL SERVICES
15375 SE 30th Place, Suite 250
Bellevue, Washington 98007
(206) 643-9803
FAX (206) 643-9827

4000 Kruse Way Place
Building One, Suite 220
Lake Oswego, Oregon 97035
(503) 636-4338
FAX (503) 636-4315

PTI ENVIRONMENTAL SERVICES
2995 BASELINE RD, SUITE 202
BOULDER, CO 80303
REPORT TO: J. HOUSTON KEMPTON
(303) 444 7270

DOCUMENT NO. 1761

BILLING REFERENCE:
C132-0301 Metem Mobility
C132-0401

CHAIN OF CUSTODY RECORD
& ANALYTICAL REQUEST

PROJECT
C132-0301; C132-0401

SAMPLERS: (Signature) 11/23/91
Centa Traver

	SAMPLE NO.	SITE & TAG NUMBER	DATE	TIME	SAMPLE MATRIX: WATER	SEDIMENT	TISSUE	AIR	OIL	OTHER	NUMBER OF CONTAINERS	REMARKS: ANALYSIS & TAG NO.	PRES.
24	EQ-2A-31,32	32509	11/20/91	1143	X						1	Methylated As	NONE
24	EQ-2A-31,32	32508	11/20/91	1143	X						1	"	"
25	EQ-2B-22,23	32518	11/20/91	13:35	X						1	"	"
25	EQ-2B-22,23	32519	11/20/91	13:36	X						1	"	"
26	EQ-3A-31,32	32546	11/21/91	11:17	X						1	"	"
26	EQ-3A-31,32	32547	11/21/91	11:17	X						1	"	"
27	SM-1	33349	11/22/91	11:10	X						1	"	"
27	SM-1	33348	11/22/91	11:10	X						1	"	"
28	SM-4	33357	11/22/91	11:10	X						1	"	"
28	SM-4	33358	11/22/91	11:10	X						1	"	"

RELINQUISHED BY: (Signature) Centa Traver 11/23/91	**RECEIVED BY:** (Signature)	**DATE/TIME**
RELINQUISHED BY: (Signature)	**RECEIVED BY:** (Signature) Battelle	**DATE/TIME** 11/25/91 2:00
RELINQUISHED BY: (Signature)	**REC'D. BY MOBILE LAB FOR FIELD ANALYSIS:** (Signature)	**DATE/TIME**
DISPATCHED BY: (Signature) **DATE/TIME**	**RECEIVED FOR LAB BY:** (Signature)	**DATE/TIME**
METHOD OF SHIPMENT:		

Distribution: Original & One Copy - Accompany Shipment
One Copy - Survey Coordinator Field Files

PTI
ENVIRONMENTAL SERVICES
2995 Baseline Road, Suite 202
Boulder, Colorado 80303
(303) 444-7270
FAX (303) 444-7528

CHAIN OF CUSTODY RECORD

PAGE: 1 OF 1

PROJECT C1320401 | SAMPLERS: Chris Sellstone/Andy Davis

SAMPLE I.D.	PTI TAG NUMBER	DATE	TIME	SAMPLE MATRIX	NO. OF CONT.	ANALYTES							REMARKS
						AVS	Assem	Crsem	Pbsem				
~~SC-1-1~~	32971	11-18	16:01	SED	1	X	X	X	X				
~~SC-4-1~~	33416	11-19	16:00	SED	1	X	X	X	X				
SC-3-4	33435	11-19	15:30	SED	1	X	X	X	X				

Called to correct the sample I.D as they were wrong however the TAC No. was ok They matched.

RELINQUISHED BY:	RECEIVED BY:	DATE	TIME
RELINQUISHED BY:	RECEIVED BY:	DATE	TIME
RELINQUISHED BY:	RECEIVED BY:	DATE	TIME

SHIPPING:

DISPATCHED BY:	DATE	TIME	RECEIVED BY (LABORATORY):	DATE	TIME
[signature]	12/11/91	1500			

METHOD OF SHIPMENT: Federal Express

PTI
ENVIRONMENTAL SERVICES
15375 SE 30th Place, Suite 250
Bellevue, Washington 98007
(206) 643-9803
FAX (206) 643-9827

4000 Kruse Way Place
Building One, Suite 220
Lake Oswego, Oregon 97035
(503) 636-4338
FAX (503) 636-4315

HUFFMAN
TOC Section

PTI ENVIRONMENTAL SERVICES
2995 BASELINE RD, SUITE 202
BOULDER, CO 80303
(303) 444-7270

DOCUMENT NO. 1767

REPORT TO: J. HEUSTEN KAMPIEN

CHAIN OF CUSTODY RECORD
& ANALYTICAL REQUEST

PROJECT C132-0301, C132-0401

SAMPLERS: *(Signature)* [signature] 11/24/91

SAMPLE NO.	~~SITE~~ TAG NO.	DATE	TIME	WATER	SEDIMENT	TISSUE	AIR	OIL	OTHER	NUMBER OF CONTAINERS	REMARKS ANALYSIS ~~TAG NO.~~	PRES.
OW-101	32560	11/22/91	11:00	X						1	TOC Fract.	—
OW-41	25981	11/21/91	14:45	X						1	"	—
OW-48A	24215	11/22/91	16:45	X						1	"	—
OW-17	32263	11/20/91	14:00	X						1	"	—
OW-38	24288	11/22/91	8:45	X						1	"	—
~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~X~~						~~1~~	~~"~~	~~—~~
~~[illegible]~~	~~32560~~	~~11/22/91~~	~~11:00~~	~~X~~						~~1~~	~~"~~	~~—~~
~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~X~~						~~1~~	~~"~~	~~—~~
~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~X~~						~~1~~	~~"~~	~~—~~
~~[illegible]~~	~~[illegible]~~	~~11/22/91~~	~~11:00~~	~~X~~						~~1~~	~~"~~	~~—~~
~~[illegible]~~	~~[illegible]~~	~~11/22/91~~	~~[illegible]~~	~~X~~						~~1~~	~~"~~	~~—~~
~~[illegible]~~	~~[illegible]~~	~~11/23/91~~	~~[illegible]~~	~~X~~						~~1~~	~~"~~	~~—~~
OW-32 ~~[illegible]~~	33377	11/23/91	15:30	X						1	"	—
OW-32 ~~[illegible]~~	33378	11/23/91	15:30	X						1	"	—
OW-32 ~~[illegible]~~	33379	11/23/91	15:30	X						1	"	—
OW-36	33383	11/23/91	10:45	X					*	1	"	—
OW-36	33384	11/23/91	10:45	X						1	"	—
OW-36	33385	11/23/91	10:45	X						1	"	—
OW-37	33389	11/23/91	11:45	X						1	"	—
OW-37	33390	11/23/91	11:45	X						1	"	—
OW-37	33391	11/23/91	11:45	X						1	"	—

RELINQUISHED BY: *(Signature)*	RECEIVED BY: *(Signature)*	DATE/TIME
[signature] 11/24/91		

RELINQUISHED BY: *(Signature)*	RECEIVED BY: *(Signature)*	DATE/TIME

RELINQUISHED BY: *(Signature)*	REC'D. BY MOBILE LAB FOR FIELD ANALYSIS: *(Signature)*	DATE/TIME

DISPATCHED BY: *(Signature)*	DATE/TIME	RECEIVED FOR LAB BY: *(Signature)*	DATE/TIME

METHOD OF SHIPMENT:

Distribution: Original & One Copy – Accompany Shipment
One Copy – Survey Coordinator Field Files

HHF

PTI
ENVIRONMENTAL SERVICES
15375 SE 30th Place, Suite 250
Bellevue, Washington 98007
(206) 643-9803
FAX (206) 643-9827

4000 Kruse Way Place
Building One, Suite 220
Lake Oswego, Oregon 97035
(503) 636-4338
FAX (503) 636-4315

DOCUMENT NO. 1768

CHAIN OF CUSTODY RECORD

PROJECT C132-0301, C132-C1C1

SAMPLERS: (Signature) Curtis Tracy 11/21/91

SAMPLE NO.	~~SITE~~ TTK. NUMBER	DATE	TIME	SAMPLE MATRIX: WATER	SEDIMENT	TISSUE	AIR	OIL	OTHER	NUMBER OF CONTAINERS	REMARKS: ANALYSIS TAG NO.	PP-S.
CW-13	32579	11/23/91	17:00	X						1	TOC Grav.	—
CW-13	32580	11/23/91	17:00	X						1	"	—
CW-13	32581	11/23/91	17:00	X						1	"	—
CW-11	32573	11/22/91	15:00	X						1	"	—
CW-11	32574	11/22/91	15:00	X						1	"	—
CW-11	32575	11/22/91	15:00	X						1	"	—
CW-16	32570	11/22/91	10:00	X						1	"	—
CW-16	32571	11/22/91	10:00	X						1	"	—
CW-16	32572	11/22/91	10:00	X						1	"	—
CW-31	33371	11/23/91	11:00	X						1	"	—
CW-31	33372	11/22/91	14:00	X						1	"	—
CW-31	33373	11/23/91	14:00	X						1	"	—
SM-1	33331, 33350	11/22/91	11:10	X						2	"	—
SM-4	33359, 33360	11/22/91	11:10	X						2	"	—
EG-1B-3941	33310, 33311	11/19/91	12:58	X						2	"	—
EG-1B-2627	33308, 33309	11/19/91	12:50	X						2	"	—
EG-2C-7,8,9	32513, [redacted]	11/20/91	13:15	X						1	"	—
EG-3B-6,7,8,9	32557	11/21/91	12:10	X						1	"	—
EG-3B-31,32,33	32548	11/21/91	11:25	X						1	"	—
EG-3B-31,32,33	32514	11/20/91	13:16	X						1	"	—

RELINQUISHED BY: (Signature) Curtis Tracy 11/21/91	**RECEIVED BY:** (Signature)	**DATE/TIME**
RELINQUISHED BY: (Signature)	**RECEIVED BY:** (Signature)	**DATE/TIME**
RELINQUISHED BY: (Signature)	**REC'D. BY MOBILE LAB FOR FIELD ANALYSIS:** (Signature)	**DATE/TIME**
DISPATCHED BY: (Signature) **DATE/TIME**	**RECEIVED FOR LAB BY:** (Signature)	**DATE/TIME**
METHOD OF SHIPMENT:		

Distribution: Original & One Copy – Accompany Shipment
One Copy – Survey Coordinator Field Files

pace
INCORPORATED
THE ASSURANCE OF QUALITY

10353

CHAIN-OF-CUSTODY RECORD
Analytical Request

Client

Address

Phone

Report To:

Bill To:

P.O. # / Billing Reference

Project Name / No.

Pace Client No.

Pace Project Manager

Pace Project No.

*Requested Due Date:

Sampled By (PRINT):

Sampler Signature

Date Sampled

ITEM NO.	SAMPLE DESCRIPTION	TIME	MATRIX	PACE NO.	NO. OF CONTAINERS	PRESERVATIVES: UNPRESERVED	H_2SO_4	HNO_3	VOA	ANALYSES REQUEST	REMARKS
1											
2											
3											
4											
5											
6											
7											
8											

COOLER NOS.	BAILERS	SHIPMENT METHOD OUT : DATE	SHIPMENT METHOD RETURNED : DATE

Additional Comments

ITEM NUMBER	RELINQUISHED BY / AFFILIATION	ACCEPTED BY / AFFILIATION	DATE	TIME

BAFT
CM

PTI
ENVIRONMENTAL SERVICES
2995 Baseline Road, Suite 202
Boulder, Colorado 80303
(303) 444-7270
FAX (303) 444-7528

CHAIN OF CUSTODY RECORD

PAGE: 1 OF 1

PROJECT
Woburn C1320401

SAMPLERS: Chris Sellstone/ Andy Davis

SAMPLE I.D.	PTI TAG NUMBER	DATE	TIME	SAMPLE MATRIX	NO. OF CONT.	ANALYTES	REMARKS
SC-1-4	33482	11/18	17:57	sed	1	+ AVS; + Mineralogy by microscope	forward to geology
SC-1-12	33481	11/18	18:00	sed	1		lab after avs has
SC-2-2	33414	11/19	16:00	sed	1		been run
SC-2-6	33418	11/19	16:00	sed	1		"
SC-3-1	33432	11/20	15:30	sed	1		"
SC-3-7	33438	11/20	15:30	sed	1		"

RELINQUISHED BY:	RECEIVED BY:	DATE	TIME
Chris Sellstone		12/5/91	16:00
RELINQUISHED BY:	RECEIVED BY:	DATE	TIME
RELINQUISHED BY:	RECEIVED BY:	DATE	TIME

SHIPPING:

DISPACHED BY:	DATE	TIME	RECEIVED BY (LABORATORY):	DATE	TIME
METHOD OF SHIPMENT:					

PTI
ENVIRONMENTAL SERVICES
15375 SE 30th Place, Suite 250
Bellevue, Washington 98007
(206) 643-9803
FAX (206) 643-9827

4000 Kruse Way Place
Building One, Suite 220
Lake Oswego, Oregon 97035
(503) 636-4338
FAX (503) 636-4315

PTI ENVIRONMENTAL SERVICES
2995 BASELINE RD, SUITE 202
BOULDER, CO 80303
(303) 444-7270
REPORT TO: T. HOUSTON KEMPEN

DOCUMENT NO. 1762

BILLING REF: C132-0301 Metals Nos. only

CHAIN OF CUSTODY RECORD & ANALYTICAL REQUEST

PROJECT C132-0301

SAMPLERS: (Signature) Carolyn Travers 11/23/91

SAMPLE NO.	SITE TAG NO.	DATE	TIME	SAMPLE MATRIX: WATER	SEDIMENT	TISSUE	AIR	OIL	OTHER	NUMBER OF CONTAINERS	REMARKS: ANALYSIS TAG NO.	PRES.
MW-31	24245	11/23/91	14:00	X						1	NO_2 NO_3	—
CW-31	24241	11/23/91	14:00	X						1	PO_4, NH_4	H_2SO_4
CW-31	24243	11/23/91	14:00	X						1	Cl, SO_4	[redacted]
CW-31	24249	11/23/91	14:00	X						1	Cr (VI)	[redacted]
CW-32	24261	11/23/91	15:30	X						1	Cr (VI)	—
CW-32	24257	11/23/91	15:30	X						1	NO_2 NO_3	—
CW-32	24255	11/23/91	15:30	X						1	Cl SO_4	—
CW-32	24256	11/23/91	15:30	X						1	PO_4, NH_4	H_2SO_4
CW-36	24268	11/23/91	10:45	X						1	PO_4, NH_4	H_2SO_4
CW-36	24269	11/23/91	10:45	X						1	NO_2 NO_3	—
CW-36	24273	11/23/91	10:45	X						1	Cr (VI)	—
CW-36	24267	11/23/91	10:45	X						1	Cl, SO_4	—
CW-37	24280	11/23/91	11:45	X						1	PO_4, NH_4	H_2SO_4
CW-37	24285	11/23/91	11:45	X						1	Cr (VI)	—
CW-37	24279	11/23/91	11:45	X						1	Cl SO_4	—
CW-37	24281	11/23/91	11:45	X						1	NO_2 NO_3	—
CW-43	25525	11/23/91	17:00	X						1	Cr (VI)	—
CW-43	10198	11/23/91	17:00	X						1	Cl, SO_4	—
CW-43	10200	11/23/91	17:00	X						1	NO_2 NO_3	—
CW-43	10199	11/23/91	17:00	X						1	PO_4, NH_4	H_2SO_4
CW-48A	24218	11/22/91	16:45	X						1	Cl SO_4	—

RELINQUISHED BY: (Signature) Carolyn Travers 11/23/91	**RECEIVED BY:** (Signature)	**DATE/TIME**
RELINQUISHED BY: (Signature)	**RECEIVED BY:** (Signature)	**DATE/TIME**
RELINQUISHED BY: (Signature)	**REC'D. BY MOBILE LAB FOR FIELD ANALYSIS:** (Signature)	**DATE/TIME**
DISPATCHED BY: (Signature) **DATE/TIME**	**RECEIVED FOR LAB BY:** (Signature)	**DATE/TIME**
METHOD OF SHIPMENT:		

Distribution: Original & One Copy – Accompany Shipment
One Copy – Survey Coordinator Field Files

PTI
ENVIRONMENTAL SERVICES
15375 SE 30th Place, Suite 250
Bellevue, Washington 98007
(206) 643-9803
FAX (206) 643-9827

4000 Kruse Way Place
Building One, Suite 220
Lake Oswego, Oregon 97035
(503) 636-4338
FAX (503) 636-4315

TMA

DOCUMENT NO. 1771

CHAIN OF CUSTODY RECORD

PROJECT C1320401 WOODWARD HILL'S BROOK HOLDING AREA

SAMPLERS: *(Signature)*

SAMPLE NO.	SITE TAG NO	DATE	TIME	SAMPLE MATRIX: WATER	SEDIMENT	TISSUE	AIR	OIL	OTHER (SAMPLE SIZE)	NUMBER OF CONTAINERS	REMARKS: ANALYSIS TAG NO.	REMARKS: PREP.
~~3251~~	~~EQ-2A-14~~	~~11/20/91~~	~~12:12~~	~~X~~						1		
EQ-2A-14	HGHA INTERSTITIAL WATER	11/20/91	12:12	X					40mL	1	NH_4, PO_4	H_2SO_4
EQ-2A-36	"	11/20/91	12:06	X					40mL	1	NH_4, PO_4	H_2SO_4
EQ-2B-17,18	"	11/20/91	12:15	X					1L	2	NH_4, PO_4	H_2SO_4
EQ-2A-11,12	"	11/20/91	12:15	X					100mL	1	Cr VI	—
EQ-2A-23,24	"	11/20/91	11:46	X					100mL	1	Cr VI	—
EQ-2A-18,19,20,21	"	11/20/91	11:19	X					200mL	1	NO_2, NO_3, SO_4	—
EQ-2A-37,38,39,40	"	11/20/91	11:27	X					200mL	1	NO_2 NO_3 Cl SO_4	—
EQ-2B-AN-10W	(CELLS 36-112) BLANK NO	11/20/91	11:20	X					200mL	1	NO_2 NO_3 Cl SO_4	—

RELINQUISHED BY: *(Signature)*	RECEIVED BY: *(Signature)*	DATE/TIME
PTI	Cecilia Tsai	
RELINQUISHED BY: *(Signature)*	**RECEIVED BY:** *(Signature)*	**DATE/TIME** 11/21/91 9:?? AM
RELINQUISHED BY: *(Signature)*	**REC'D. BY MOBILE LAB FOR FIELD ANALYSIS:** *(Signature)*	**DATE/TIME**
DISPATCHED BY: *(Signature)*	**DATE/TIME**	**RECEIVED FOR LAB BY:** *(Signature)* — **DATE/TIME**
METHOD OF SHIPMENT:		

Distribution: Original & One Copy – Accompany Shipment
One Copy – Survey Coordinator Field Files

TMA

PTI
ENVIRONMENTAL SERVICES

15375 SE 30th Place, Suite 250
Bellevue, Washington 98007
(206) 643-9803
FAX (206) 643-9827

TMA

4000 Kruse Way Place
Building One, Suite 220
Lake Oswego, Oregon 97035
(503) 636-4338
FAX (503) 636-4315

CLIENT: PTI ENVIRONMENTAL SERVICES
2997 BASELINE RD
BOULDER, CO 80303
(303) 444-7270
REPORT TO: J. HOUSTON KEMPTON

DOCUMENT NO. 1773

BILL TO: PTI BOULDER
BILLING REFERENCE:
0132-C3C1 Metals Mobility
~~0132-C3C1 HBHA~~

CHAIN OF CUSTODY RECORD
ANALYTICAL REQUEST

PROJECT 0132-C3C1 Metals Mobility ~~0132-C3C~~

SAMPLERS: (Signature) Carter Travis 11/20/91

SAMPLE NO.	SITE ~~TAG NO.~~	DATE	TIME	SAMPLE MATRIX: WATER	SEDIMENT	TISSUE	AIR	OIL	OTHER	NUMBER OF CONTAINERS	REMARKS: ANALYSIS ~~TAG NO.~~	PRES.
CW-17	32267	11/20/91	14:31	X						1	PO_4, NH_4	H_2SO_4
CW-17b	23297	11/20/91	15:00	X						1	PO_4, NH_4	H_2SO_4
CW-42	32297	11/20/91	16:30	X						1	PO_4, NH_4	H_2SO_4
CW-19A	32279	11/20/91	17:21	X						1	PO_4, NH_4	H_2SO_4
CW-17	32267	11/20/91	14:31	X						1	NO_2, NO_3	—
CW-17b	23297	11/20/91	14:35	X						1	NO_2, NO_3	—
CW-42	32298	11/20/91	16:30	X						1	NO_2, NO_3	—
CW-19A	32280	11/20/91	12:20	X						1	NO_2, NO_3	—
OW-17	32266	11/20/91	11:55	X						1	Cl, SO_4	—
OW-17b	23230	11/20/91	14:52	X						1	Cl, SO_4	—
OW-42	32296	11/20/91	16:30	X						1	Cl, SO_4	—
OW-19A	32278	11/20/91	12:17	X						1	Cl, SO_4	—
CW-17	32272	11/20/91	[illegible]	X						1	Cr(VI)	—
CW-17b	32297	11/20/91	[illegible]	X						1	Cr(VI)	—
CW-42	32299	11/20/91	16:30	X						1	Cr(VI)	—
CW-19A	32271	11/20/91	12:17	X						1	Cr(VI)	—

RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
Carter Travis 11/20/91	[signature]	[illegible]
RELINQUISHED BY: (Signature)	**RECEIVED BY:** (Signature)	**DATE/TIME**
RELINQUISHED BY: (Signature)	**REC'D. BY MOBILE LAB FOR FIELD ANALYSIS:** (Signature)	**DATE/TIME**
DISPATCHED BY: (Signature) / **DATE/TIME**	**RECEIVED FOR LAB BY:** (Signature)	**DATE/TIME**
METHOD OF SHIPMENT:		

Distribution: Original & One Copy – Accompany Shipment
One Copy – Survey Coordinator Field Files

SEND TO TMA

TMA

PTI
ENVIRONMENTAL SERVICES
~~15375 SE 30th Place, Suite 250~~
Bellevue, Washington 98007
(206) 643-9803
FAX (206) 643-9827

4000 Kruse Way Place
Building One, Suite 220
Lake Oswego, Oregon 97035
(503) 636-4338
FAX (503) 636-4315

7995 BASELINE RD.
BOULDER CO 80303
(303) 444 7270
(303) 444 7528 (FAX)
c/o J. HOUSTON KEMMERER

DOCUMENT NO. 1774

CHAIN OF CUSTODY RECORD

C132-0301
C132-0301

PROJECT HBHA INTERSTITIAL C1320401 WATER STUDY

SAMPLERS: (Signature) 11/21/91

SAMPLE NO.	~~SITE~~ TAG NO	DATE	TIME	SAMPLE MATRIX: WATER	SEDIMENT	TISSUE	AIR	OIL	SAMPLE VOLUME OTHER	NUMBER OF CONTAINERS	REMARKS: ANALYSE ~~TAG NO~~	PRES.
EQ-3A-17	33444	11/21/91	12:01	X					50mL	1	PO_4, NH_4	H_2SO_4
EQ-3A-27	33446	11/21/91	12:15	X					50mL	1	PO_4, NH_4	H_2SO_4
EQ-3B-16-40	32552	11/21/91	11:39	X					250mL	1	NO$_3$, TC, Cl, SO$_4$	~~H_2SO_4~~ NONE
[illegible]	[illegible]	[illegible]	[illegible]	✓					200mL	1	NO$_3$, TC	NONE
[illegible]												
EQ [illegible]	33445	11/21/91	12:05	X					200mL	1	[illegible]	NONE
EQ-3A-11.12	~~33551~~ 32551	11/21/91	11:33	X					200mL	1	Cr(VI)	NONE
EQ-3A-2728	~~32550~~ 32550	11/21/91	11:22	X					200mL	1	Cr(VI)	NONE
CW-11	32440	11/21/91	15:[illegible]	X						1	Cr(VI)	NONE
CW-17	32218	11/21/91	17:00	X*						1	Cl, SO_4	NONE
CW-12	32236	11/21/91	12:05	X						1	Cr(VI)	NONE
CW-11	32441	11/21/91	15:[illegible]	X						1	Cl, SO_4	NONE
CW-2	32230	11/21/91	12:[illegible]	X						1	Cl, SO_4	NONE
CW-[illegible]	32221	11/21/91	17:[illegible]	X						1	Cr(VI)	NONE
CW-17	32219	11/21/91	17:00	X						1	PO_4, NH_4, H_2SO_4	
CW-17	32220	11/21/91	17:00	X						1	NO$_3$, NO$_2$	—
CW-12	32231	11/21/91	12:05	X						1	PO_4, NH_4	H_2SO_4
CW-12	32232	11/21/91	12:05	X						1	NO$_3$, NO$_2$	—
CW-11	32586	11/21/91	15:25	X						1	NO$_3$, Cl	—
CW-11	32587	11/21/91	15:28	X						1	NH_4, TC	H_2SO_4

RELINQUISHED BY: (Signature) Carolyn Travers 11/21/91	**RECEIVED BY:** (Signature) [illegible]	**DATE/TIME** [illegible]
RELINQUISHED BY: (Signature)	**RECEIVED BY:** (Signature) H. Smith	**DATE/TIME** 11/24/91 1:20 pm
RELINQUISHED BY: (Signature)	**REC'D. BY MOBILE LAB FOR FIELD ANALYSIS:** (Signature)	**DATE/TIME**
DISPATCHED BY: (Signature) **DATE/TIME**	**RECEIVED FOR LAB BY:** (Signature)	**DATE/TIME**
METHOD OF SHIPMENT:		

Distribution: Original & One Copy – Accompany Shipment
One Copy – Survey Coordinator Field Files

TMA

PTI TMA
ENVIRONMENTAL SERVICES

15375 SE 30th Place, Suite 250
Bellevue, Washington 98007
(206) 643-9803
FAX (206) 643-9827

4000 Kruse Way Place
Building One, Suite 220
Lake Oswego, Oregon 97035
(503) 636-4338
FAX (503) 636-4315

CLIENT: PTI ENVIRONMENTAL SERVICES
2495 BASELINE RD, SUITE 202
BOULDER, CO 80303
(303) 444-7270
REPORT TO: J. HOUSTON KEMPTON

DOCUMENT NO. 1775

CHAIN OF CUSTODY RECORD
ANALYTICAL REQUEST

PROJECT 0132-0301 ~~0132-0110~~

SAMPLERS: (Signature) Connie Travis 11/23/91

SAMPLE NO.	SITE TAG. NO.	DATE	TIME	SAMPLE MATRIX: WATER	SEDIMENT	TISSUE	AIR	OIL	OTHER	NUMBER OF CONTAINERS	REMARKS: ANALYSIS TAG NO.	PRES.
CW-11	24212	11/22/91	15:00	X						1	Cr(VI)	—
CW-16	32256	11/22/91	10:00	X						1	NO_3 NO_2	—
CW-11	24206	11/22/91	15:00	X						1	Cl^- SO_4	—
CW-16	32255	11/22/91	10:00	X						1	Cl, SO_4	—
CW-16	32255	11/22/91	10:00	X						1	PO_4, NH_4	H_2SO_4
CW-16	32260	11/22/91	10:00	X						1	Cr(VI)	—
CW-1	24207	11/22/91	1500	X						1	PO_4 NH_4	H_2SO_4
CW-11	24208	11/22/91	1500	X						1	NO_2, NO_3	—
CW-38	24291	11/22/91	845	X						1	Cl, SO_4	—
CW-38	24292	11/22/91	845	X						1	PO_4, NH_4	H_2SO_4
CW-38	24293	11/22/91	845	X						1	NO_2 NO_3	—
CW-38	24297	11/22/91	845	X						1	Cr(VI)	—
CW-101	32563	11/22/91	1100	X						1	Cr(VI)	—
CW-101	32564	11/22/91	1100	X						1	Cl SO_4	—
CW-101	32566	11/22/91	1100	X						1	NO_2 NO_3	—
CW-101	32567	11/22/91	1100	X						1	PO_4 NH_4	H_2SO_4
CW-11A	24218	11/22/91	1645	X						1	Cl SO_4	—
CW-11A	24219	11/22/91	1645	X						1	PO_4 NH_4	H_2SO_4
CW-11A	24220	11/22/91	1645	X						1	NO_2 NO_3	—
CW-11A	24221	11/22/91	1645	X						1	Cr(VI)	—

RELINQUISHED BY: (Signature) Connie Travis 11/23/91	**RECEIVED BY:** (Signature)	**DATE/TIME**
RELINQUISHED BY: (Signature)	**RECEIVED BY:** (Signature)	**DATE/TIME**
RELINQUISHED BY: (Signature)	**REC'D. BY MOBILE LAB FOR FIELD ANALYSIS:** (Signature)	**DATE/TIME**
DISPATCHED BY: (Signature) **DATE/TIME**	**RECEIVED FOR LAB BY:** (Signature)	**DATE/TIME**
METHOD OF SHIPMENT:		

Distribution: Original & One Copy – Accompany Shipment
One Copy – Survey Coordinator Field Files

PTI
ENVIRONMENTAL SERVICES
15375 SE 30th Place, Suite 250
Bellevue, Washington 98007
(206) 643-9803
FAX (206) 643-9827

4000 Kruse Way Place
Building One, Suite 220
Lake Oswego, Oregon 97035
(503) 636-4338
FAX (503) 636-4315

CLIENT: PTI ENVIRONMENTAL SERVICES
2995 BASELINE RD, SUITE 202
BOULDER, CO 80303
(303) 444-7270

REPORT TO: J. HOUSTON KEMPTON **DOCUMENT NO.** 1776

CHAIN OF CUSTODY RECORD & ANALYTICAL REQUEST

PROJECT 0132-0401 **SAMPLERS:** *(Signature)* Carla Travers 11/22/91

SAMPLE NO.	SITE & TAG NO.	DATE	TIME	SAMPLE MATRIX: WATER	SEDIMENT	TISSUE	AIR	OIL	OTHER	NUMBER OF CONTAINERS	REMARKS: ANALYSIS & TAG NO.
SM-1	33346	11/22/91	1110	X						1	[illegible], NO_2, NO_3, Cl, SO_4
SM-1	33347	11/22/91	1110	X						1	PO_4, NH_4
SM-1	33345	11/22/91	1110	X						1	Cr (VI)
SM-4	33354	11/22/91	1120	X						1	Cl, SO_4, NO_2, NO_3
SM-4	33355	11/22/91	1120	X						1	PO_4, NH_4
SM-4	33356	11/22/91	1120	X						1	Cr (VI)

RELINQUISHED BY: *(Signature)* Carla Travers 11/22/91	**RECEIVED BY:** *(Signature)* Tom St Thomas	**DATE/TIME**
RELINQUISHED BY: *(Signature)*	**RECEIVED BY:** *(Signature)*	**DATE/TIME**
RELINQUISHED BY: *(Signature)*	**REC'D. BY MOBILE LAB FOR FIELD ANALYSIS:** *(Signature)*	**DATE/TIME**
DISPATCHED BY: *(Signature)*	**DATE/TIME**	**RECEIVED FOR LAB BY:** *(Signature)* **DATE/TIME**
METHOD OF SHIPMENT:		

Distribution: Original & One Copy – Accompany Shipment
One Copy – Survey Coordinator Field Files

pace. INCORPORATED THE ASSURANCE OF QUALITY

JMA

10357

CHAIN-OF-CUSTODY RECORD
Analytical Request

Client: PTI ENVIRONMENTAL
Address: 2995 BASELINE RD, SUITE 202
BOULDER COLORADO 80303
Phone: (303) 444-7270

Report To: J. HOUSTON KEMPTON
Bill To:
P.O. # / Billing Reference: C1320301
Project Name / No.: GSIP / METALS MOBILITY

Pace Client No.
Pace Project Manager
Pace Project No.
Requested Due Date:

Sampled By (PRINT): CHRISTOPHER SELLSTONE / CONNIE TRAVERS
Sampler Signature: [signature]
Date Sampled: 11/19/91

ITEM NO.	SAMPLE DESCRIPTION			TIME	MATRIX	PACE NO.	NO. OF CONTAINERS	UNPRESERVED	H_2SO_4	HNO_3	VOA			Cl-SO4	PO4/NH4 +	NO2/NO3	CR VI	Cl	SO4	PO4	NH			REMARKS
1	OW-1A	32206	11/19	16:51	W		1	X		X				X										
2	OW-1A	32207	11/19	17:05	W		1		X						X									
3	OW-1A	32208	11/19	17:10	W		1	X								X								
4	OW-1A	32212	11/19	16:55	W		1	X									X							
5	OW-~~1A~~15	32242	11/19	14:51	W		1	X						X										
6	OW-15	32243	11/19	14:51	W		1		X						X									
7	OW-15	32244	11/19	14:51	W		1	X								X								
8	OW-15	32248	11/19	14:52	W		1	X									X							

COOLER NOS.	BAILERS	SHIPMENT METHOD OUT DATE	RETURNED DATE

ITEM NUMBER	RELINQUISHED BY / AFFILIATION	ACCEPTED BY / AFFILIATION	DATE	TIME
		Barb Prairie / Sequoia Shermen	11/20/91	8:45

Additional Comments

pace
INCORPORATED
THE ASSURANCE OF QUALITY

10358

CHAIN-OF-CUSTODY RECORD
Analytical Request

t PTI ENVIRONMENTAL
ess 2995 BASELINE RD
NLDER CO 80303
ne 303-444-7270

Report To: TOM DOYLE
Bill To:
P.O. # / Billing Reference C1320401
Project Name / No.

Pace Client No.
Pace Project Manager
Pace Project No.
*Requested Due Date:

pled By (PRINT): CHRISTOPHER SELLSTONE
pler Signature
Date Sampled: 11/19/91

ITEM NO.	SAMPLE DESCRIPTION	PACE SAMPLE NO.	TIME	MATRIX	PACE NO.	NO. OF CONTAINERS	PRESERVATIVES: UNPRESERVED	H_2SO_4	HNO_3	VOA	ANALYSES REQUEST: NO_2 NO_3	Cl	SO_4	Cr VI	PO_4	NH_4	Cr (DIS)	REMARKS
1	EQ-1B-4	33309	14:00	W		1		X						X	X			40mL TOT
2	EQ-1B-29	33310	14:00	W		1		X							X			40mL TOT
3	EQ-1A-12,11,09	33314	13:R	W		1		X			X	X	X					200mL
4	EQ-1A-36,37,35	33313	13:15	W		1					X	X	X					150mL
5	EQ-1B-17,18	33304	12:35	W		1									X			100mL
6	EQ-1B-32,33	33305	12:20	W		1									X			

COOLER NOS	BAILERS	SHIPMENT METHOD OUT DATE	SHIPMENT METHOD RETURNED DATE

onal Comments

ITEM NUMBER	RELINQUISHED BY / AFFILIATION	ACCEPTED BY / AFFILIATION	DATE	TIME
		Barb Vine/Shermer	11/20/91	8:45

pace INCORPORATED
THE ASSURANCE OF QUALITY

TMA

10359

CHAIN-OF-CUSTODY RECORD
Analytical Request

ent PTI ENVIRONMENTAL SERVICES
dress 2995 BASELINE RD, SUITE 202
BOULDER, COLORADO 80303
one 303-444-7270

Report To: J. HOUSTON KEMPTON
Bill To:
P.O. # / Billing Reference C1320301
Project Name / No. GSIP / Metals Mobility

Pace Client No.
Pace Project Manager
Pace Project No.
*Requested Due Date:

mpled By (PRINT): CONNIE TRAVERS / CHRISTOPHER SELLSTONE
mpler Signature: Connie L. Travers
Date Sampled: 11/18/91

ITEM NO.	SAMPLE DESCRIPTION			TIME	MATRIX	PACE NO.	NO. OF CONTAINERS	PRESERVATIVES: UNPRESERVED	H_2SO_4	HNO_3	VOA	ANALYSES REQUEST: Ca - SO_4	PO4, NH4, NO3, Cl	REMARKS
1	OW-33A	32290	11/18/91	1630	W		1	X				X		
2	OW-33A	32291	11/18/91	1630	W		1		X				X	
3	OW-33A	32292	11/18/91	1630	W		1	X				X		
4	OW-33A	32296	11/18/91	1630	W		1	X				X		
5														
6														
7														
8														

COOLER NOS	BAILERS	SHIPMENT METHOD OUT DATE	RETURNED DATE

ITEM #	RELINQUISHED BY AFFILIATION	ACCEPTED BY AFFILIATION	DATE	TIME
		Connie Travers PTI	11/21/91	8:45

itional Comments

SINAL

SEE REVERSE SIDE FOR INSTRUCTIONS

APPENDIX B7

Fish Sampling Logs/
Chain of Custody Forms

COOLER/SAMPLE RECEIPT FORM

Rev.01 10/7/91

ESE Cooler # ~~_____~~
Client Cooler # ✓
No Cooler _____

Project: Industri-Plex Superfund Site Date/Time Received: 11-5-91 930

USE OTHER SIDE OF THIS FORM TO NOTE FURTHER DETAILS CONCERNING CHECK-IN PROBLEMS AND TO SPECIFY AND DESCRIBE ANY ACTION(S) REGARDING THE RESOLUTION(S) OF PROBLEMS. IF SHIPMENT WAS ACCEPTED AND IF REQUESTED, NOTE ON BACK THE ADDRESS WHERE THE EMPTY COOLER WAS RETURNED AND LIKEWISE IF THE SHIPMENT WAS REJECTED.

IF INFORMATION IS MISSING OR THERE ARE PROBLEMS NOTIFY LABORATORY PROJECT MANAGER SO THAT HE CAN NOTIFY THE PROJECT MANAGER IMMEDIATELY.

A. PRELIMINARY EXAMINATION PHASE: Date/Time cooler/sample was opened and checked: 11-5-91 930

by (print) Carol Cash (sign) Carol Cash

1. List courier delivering samples ..... U.P.S. Next Day ..... (YES) NO
2. Did cooler come with a shipping slip (air bill, etc.)? ..... (YES) NO
   If YES, attach and enter carrier and air bill number here: 1945 0682 791
3. Were custody seals on outside of cooler? ..... YES (NO)
   If YES, how many and where: _____
   If YES, enter the following: seal date: _____, seal name: _____
4. Were custody seals unbroken and intact at the date and time of arrival? ..... YES (NO)
5. Was chain-of-custody provided? ..... (YES) NO
6. Were custody papers sealed in a Ziploc® bag and taped inside to the lid? ..... YES (NO)
7. Were entries on custody papers completed? (YES) NO . If no, give details on back
8. Turnaround time included? ..... YES (NO)
9. Did you sign custody papers in the appropriate place? ..... (YES) NO
10. Was project identifiable from custody papers? If YES, enter project name at the top of this form. (YES) NO

B. SAMPLE CHECK-IN PHASE: Date samples were checked-in: 11-5-91 by (all those involved must sign below):

(print) Carol Cash (sign) Carol Cash

11. Describe packing: newspaper & ice
*12. If required, was enough ice used? (temperature maintained correctly)? ..... (YES) NO
13. Were all bottles sealed in separate plastic bags? ..... (YES) NO
*14. Did all bottles arrive unbroken and in good condition? ..... (YES) NO
15. Were all bottle labels complete (ID, date, time, signature, preservative, etc.)? ..... (YES) NO
16. Did all bottle labels agree with custody papers? If NO, indicate discrepancies on back. ..... (YES) NO
17. Were correct containers used for the tests indicated? ..... (YES) NO
*18. Were correct preservatives used when required? ..... (YES) NO
*19. pH of samples maintained correctly as required? If NO, list by ID# _____ (YES) NO
20. Was a sufficient amount of sample sent for tests indicated? ..... (YES) NO
*21. Bubbles present in VOA vials? If YES, list by ID#: N/A YES NO
22. Was lab. project manager called and status discussed? If YES, give details on the back of this form. YES NO
23. Who was called? _____ By whom? _____ on (date) _____
24. Second Party Review: _____

* Sample rejection criteria

:\WP\CHEMCOM\CRF.01

IP-O/IP-F

CHAIN OF CUSTODY

ENVIRONMENTAL SCIENCE & ENGINEERING
ONE OVERLOOK DRIVE, UNIT 16
AMHERST, NEW HAMPSHIRE 03031
PHONE: 1-603-672-2511
FAX: 1-603-672-2014

PROJECT NUMBER: 4915228.0201 | PURCHASE ORDER: NA

PROJECT NAME: INDUSTRI-PLEX SUPERFUND SITE | SAMPLED BY: ARM/SRC | PAGE 1 OF ____

CLIENT: ROUX ASSOCIATES, INC. | LABORATORY: ESE, ST. LOUIS | LABORATORY CONTACT: JIM GENOULAS

REPORT TO: DR. STEPHEN R. CLOUGH | ADDRESS: DR. F. HUANG, 11665 LILBURN PARK ROAD

INVOICE TO: | ADDRESS: ST. LOUIS, MO 63146-3535

	FIELD ID.	LABORATORY ID.	DATE	TIME	DEPTH RANGE (FT)	SAMPLE TYPE	ANALYSES REQUESTED: VOCs	BNA	% LIPID		NUMBER OF CONTAINERS	COMMENTS INSTRUCTIONS
1	PP/F/001	O	10/17/91	1201	3	Fish	✓	✓	✓		1 Ziploc	Pool fish sample for analysis
2	PP/F/002	O	10/18/91	1610	4	Fish	✓	✓	✓		"	"
3	PP/BF/001	O F 1	"	1712	12	"	✓	✓	✓		2 "	White sucker
4	PP/BF/002	O F 2	"	1714	"	"	✓	✓	✓		2 "	"
5	PP/BF/003	O F 3	"	1718	"	"	✓	✓	✓		2 "	"
	PP/P/001	F 4	"	1719	"	"	✓	✓	✓		1 "	Yellow Shiner
6	PP/F/003	O	9/21/91	1416	4	"	✓	✓	✓		"	Pool sample for analysis
7	PP/F/004	O	"	1423	4	"	✓	✓	✓		"	" "
8	HB/BF/001	O F 5	10/22/91	1130	12	"	✓	✓	✓		2 Ziploc	Catfish
9	PP/F/005	O	"	1410	4	"	✓	✓	✓		1 Ziploc	Pool fish for analysis

PRESERVATIVE CODES						CONTAINER CODE
A = NAOH B = NITRIC ACID C = REFRIGERATION\COOLER D = OTHER (REFER TO COMMENTS)	FILTERED IN FIELD	☒	☒	☒		
	FILTERING REQ'D					P = PLASTIC
	PRESERVATIVE					G = GLASS
TURN AROUND PERIOD REQUESTED	CONTAINER TYPE	O	O	O		V = VOA VIAL
	CONTAINER VOLUME	1 pt.	1 pt.	1 pt.		O = OTHER

RELINQUISHED BY:	DATE:	TIME:	RECEIVED BY: DATE: TIME:
RELINQUISHED BY:	DATE:	TIME:	RECEIVED BY: DATE: TIME:
RELINQUISHED BY:	DATE:	TIME:	RECEIVED BY: Ruth Cash DATE: 10-24-91 TIME: 930

DOES SAMPLE SHOW EVIDENCE OF TAMPERING? YES____ NO____

IP-O/IP-F

CHAIN OF CUSTODY

ENVIRONMENTAL SCIENCE & ENGINEERING
ONE OVERLOOK DRIVE, UNIT 16
AMHERST, NEW HAMPSHIRE 03031
PHONE: 1-603-672-2511
FAX: 1-603-672-2014

PROJECT NUMBER: 4915228.0201 | PURCHASE ORDER: NA

PROJECT NAME: INDUSTRI-PLEX SUPERFUND SITE | SAMPLED BY: ARM/SRC | PAGE ____ OF ____

CLIENT: ROUX ASSOCIATES, INC. | LABORATORY: ESE, ST. LOUIS | LABORATORY CONTACT: JIM GEMOULAS

REPORT TO: DR. STEPHEN R. CLOUGH | ADDRESS: DR. F. HUANG, 11665 LILBURN PARK ROAD

INVOICE TO: | ADDRESS: ST. LOUIS, MO 63146-3535

	FIELD ID.	LABORATORY ID.	DATE	TIME	DEPTH RANGE (FT)	SAMPLE TYPE	ANALYSES REQUESTED: VOCs	BNA	% LIPID		NUMBER OF CONTAINERS	COMMENTS INSTRUCTIONS
10	PP/P/002	O F 6	10/22/91	1404	12	Fish	✓	✓	✓		2 Ziploc	Yellow Shiner
11	PP/P/003	O F 7	"	1410	"	"	✓	✓	✓		"	"
12	PP/P/004	O F 8	"	1415	"	"	✓	✓	✓		"	"
13	HB/BF/002	O F 9	10/23/91	1155	"	"	✓	✓	✓		2 Ziploc	White Sucker
14	PP/BF/004	O F 16	"	1255	"	"	✓	✓	✓		"	"
15	PP/BF/005	O F 11	"	"	"	"	✓	✓	✓		"	"
16	PP/BF/006	O F 12	"	"	"	"	✓	✓	✓		"	"
17	PP/P/005	O F 13	"	"	"	"	✓	✓	✓		"	Yellow Shiner
18	PP/P/006	O F 14	"	"	"	"	✓	✓	✓		"	"

PRESERVATIVE CODES								CONTAINER CODE
A = NAOH B = NITRIC ACID C = REFRIGERATION\COOLER D = OTHER (REFER TO COMMENTS)	FILTERED IN FIELD							P = PLASTIC
	FILTERING REQ'D							G = GLASS
	PRESERVATIVE							V = VOA VIAL
TURN AROUND PERIOD REQUESTED	CONTAINER TYPE	O	O	O	O			O = OTHER
	CONTAINER VOLUME	1 gal	1 gal.	1 gal.				

RELINQUISHED BY:	DATE:	TIME:	RECEIVED BY: DATE: TIME:
RELINQUISHED BY:	DATE:	TIME:	RECEIVED BY: DATE: TIME:
RELINQUISHED BY:	DATE:	TIME:	RECEIVED BY: Carol Cook DATE: 10-24-91 TIME: 930

DOES SAMPLE SHOW EVIDENCE OF TAMPERING? YES____ NO____

CHAIN OF CUSTODY

ENVIRONMENTAL SCIENCE & ENGINEERING ONE OVERLOOK DRIVE, UNIT 16 AMHERST, NEW HAMPSHIRE 03031 PHONE: 1-603-672-2511 FAX: 1-603-672-2014	PROJECT NUMBER: 4915228.0201	PURCHASE ORDER: NA
	PROJECT NAME: INDUSTRI-PLEX SUPERFUND SITE	SAMPLED BY: ARM/SRC
		PAGE 1 OF 2
CLIENT: ROUX ASSOCIATES, INC.	LABORATORY: ESE, ST. LOUIS	LABORATORY CONTACT: John GENOULAS
REPORT TO: DR. STEPHEN R. CLOUGH	ADDRESS: DR. F. HUANG, 11665 LILBURN PARK ROAD	
INVOICE TO:	ADDRESS: ST. LOUIS, MO 63146-3535	

	FIELD ID.	LABORATORY ID.	DATE	TIME	DEPTH RANGE (FT)	SAMPLE TYPE	ANALYSES REQUESTED: Metals	BNA	% LIPID		NUMBER OF CONTAINERS	COMMENTS INSTRUCTIONS
IP-F 15	HB/BF/003		11/1/91	1107	12'	Fillet	✓	✓	✓		1 Ziploc	
IP-O 19	HB/BF/003		11/1/91	1107	12'	offal	✓	✓	✓		"	
16	HB/BF/004		"	"	"	fillet	✓	✓	✓		"	
20	HB/BF/004		"	"	"	offal	✓	✓	✓		"	
17	HB/BF/005		"	"	"	fillet	✓	✓	✓		"	
21	HB/BF/005		"	"	"	offal	✓	✓	✓		"	
18	HB/P/001		"	"	"	fillet	✓	✓	✓		"	
22	HB/P/001		"	"	"	offal	✓	✓	✓		"	
19	HB/P/002		"	"	"	fillet	✓	✓	✓		"	
23	HB/P/002		"	"	"	offal	✓	✓	✓		"	

PRESERVATIVE CODES						CONTAINER CODE
A = NAOH B = NITRIC ACID C = REFRIGERATION\COOLER D = OTHER (REFER TO COMMENTS)	FILTERED IN FIELD					P = PLASTIC
	FILTERING REQ'D					G = GLASS
	PRESERVATIVE					V = VOA VIAL
TURN AROUND PERIOD REQUESTED	CONTAINER TYPE	O	O	O		O = OTHER
	CONTAINER VOLUME	qt.	qt.	qt.		

RELINQUISHED BY: [signature]	DATE: 11/4/91	TIME: 5:00 PM	RECEIVED BY: DATE: TIME:
RELINQUISHED BY:	DATE:	TIME:	RECEIVED BY: DATE: TIME:
RELINQUISHED BY:	DATE:	TIME:	RECEIVED BY: [signature] DATE: 11-5-91 TIME: 930

DOES SAMPLE SHOW EVIDENCE OF TAMPERING? YES____ NO____

CHAIN OF CUSTODY

ENVIRONMENTAL SCIENCE & ENGINEERING
ONE OVERLOOK DRIVE, UNIT 16
AMHERST, NEW HAMPSHIRE 03031
PHONE: 1-603-672-2511
FAX: 1-603-672-2014

PROJECT NUMBER: 4915228.0201

PURCHASE ORDER: NA

PROJECT NAME: INDUSTRI-PLEX SUPERFUND SITE

SAMPLED BY: ARM/SRC

PAGE 2 OF 2

CLIENT: ROUX ASSOCIATES, INC.

LABORATORY: ESE, ST. LOUIS

LABORATORY CONTACT: JIM GEMOULAS

REPORT TO: DR. STEPHEN R. CLOUGH

ADDRESS: DR. F. HUANG, 11665 LILBURN PARK ROAD

INVOICE TO:

ADDRESS: ST. LOUIS, MO 63146-3535

FIELD ID.	LABORATORY ID.	DATE	TIME	DEPTH RANGE (FT)	SAMPLE TYPE	ANALYSES REQUESTED: Metals	BNA	% LIPID		NUMBER OF CONTAINERS	COMMENTS INSTRUCTIONS
HB/P/003		11/1/91	1107	12'	fillet	✓	✓	✓		1 Ziploc	
HB/P/003		11/1/91	1107	12'	offal	✓	✓	✓		"	

PRESERVATIVE CODES	FILTERED IN FIELD						CONTAINER CODE
A = NAOH B = NITRIC ACID C = REFRIGERATION\COOLER D = OTHER (REFER TO COMMENTS)	FILTERING REQ'D						P = PLASTIC
	PRESERVATIVE						G = GLASS
TURN AROUND PERIOD REQUESTED _____	CONTAINER TYPE						V = VOA VIAL
	CONTAINER VOLUME	qt.	qt.	qt.			O = OTHER

RELINQUISHED BY:	DATE:	TIME:	RECEIVED BY:	DATE:	TIME:
RELINQUISHED BY:	DATE:	TIME:	RECEIVED BY:	DATE:	TIME:
RELINQUISHED BY:	DATE:	TIME:	RECEIVED BY: Paul Cash	DATE: 11-5-91	TIME: 930

DOES SAMPLE SHOW EVIDENCE OF TAMPERING? YES____ NO_____